United States
Department of
Agriculture

Forest
Service

Forest Insect and Disease Conditions in the United States 1981

PSW FOREST AND RANGE
EXPERIMENT STATION
JUL 8 1982
STATION LIBRARY COPY

FOREWORD

This is the 31st annual report of insect and disease conditions in U.S. forests. It was compiled by the Forest Pest Management Staff, State and Private Forestry, Washington Office. It is intended to provide forest land managers with information on the status of major forest insect and disease pests in 1981. A more comprehensive report on distribution and population trends of these pests will be prepared every 5 years beginning in 1984.

Detailed information on any of the insects and diseases discussed in the report can be obtained directly from Forest Service Regional and Area Offices.

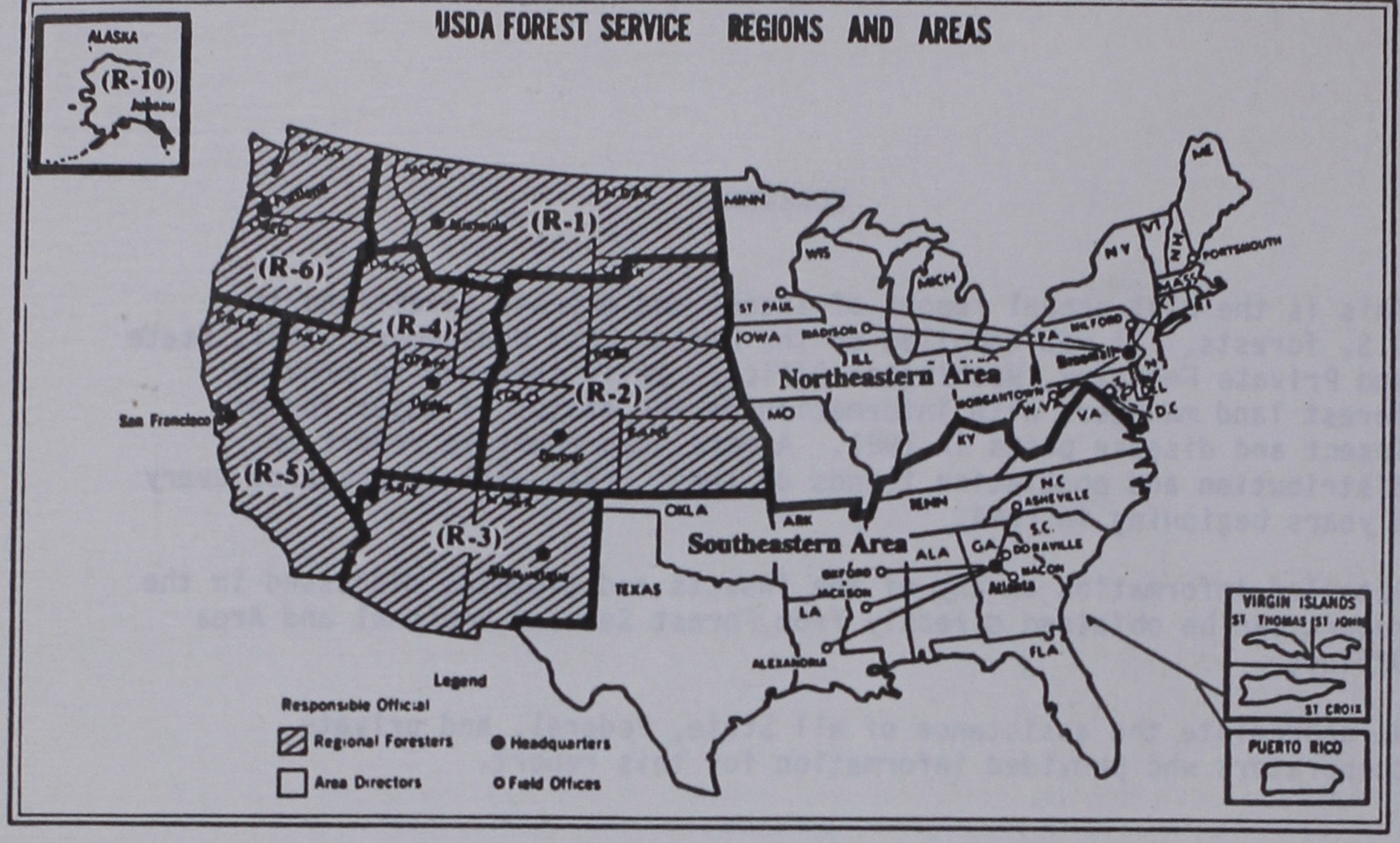
We appreciate the assistance of all State, Federal, and private cooperators who provided information for this report.

Thomas H. Hofacker, Staff Entomologist

Robert C. Loomis, Staff Pathologist

Forest Pest Management
Forest Service, U.S. Department
of Agriculture
Washington, D.C. 20013

May 1982



FOREST PEST MANAGEMENT OFFICES

Forest Pest Management offices are located at the following addresses:

Region 1
USDA Forest Service
Federal Building
Missoula, MT 59807

Region 2
USDA Forest Service
PO Box 25127
Lakewood, CO 80225

Region 3
USDA Forest Service
Federal Building
517 Gold Avenue, S.W.
Albuquerque, NM 87102

Region 4
USDA Forest Service
Federal Building
324 25th Street
Ogden, UT 84401

Region 5
USDA Forest Service
630.Sansome Street
San Francisco, CA 94111

Region 6
USDA Forest Service
PO Box 3623
Portland, OR 97208

Region 10
USDA Forest Service
Federal Office Building
PO Box 1628
Juneau, AK 99802

Northeastern Area

USDA Forest Service
370 Reed Road
Broomall, PA 19082

Northeastern Area Field Offices

USDA Forest Service
Folwell Avenue
St. Paul, MN 55108

USDA Forest Service
180 Canfield Street
Morgantown, WV 26505

USDA Forest Service
80 Daniels Street
Portsmouth, NH 03801

Southeastern Area

USDA Forest Service
1720 Peachtree Rd., N.W.
Suite 800
Atlanta, GA 30309

Southeastern Area Field Offices

USDA Forest Service
PO Box 365
Asheville, NC 28803

USDA Forest Service
2500 Shreveport Highway
Pineville, LA 71360

CONTENTS

Page

National Summary 1
Eastern Conditions 1
Western Conditions 1
Forest Insect and Disease Conditions by Regions
Northern Region (R-1) 3
Rocky Mountain Region (R-2) 7
Southwestern Region (R-3) 12
Intermountain Region (R-4) 15
Pacific Southwest Region (R-5) 18
Pacific Northwest Region (R-6) 22
Southern Region and Southeastern Area (R-8) 26
Eastern Region and Northeastern Area (R-9) 33
Alaska Region (R-10) 36
Tables 39
Figures 44
Index-Insects 47
Index-Diseases 50

1981

NATIONAL SUMMARY

Eastern Conditions

The spruce budworm and the gypsy moth were the most damaging forest insects in the Eastern United States in 1981. Gypsy moth populations reached unprecedented levels in much of the Northeast. Almost 13 million acres were defoliated (table 1); this represents 31 percent of the acreage defoliated since records were first started in 1924. Areas with detectable defoliation are shown in fig. 1. Eleven States are now generally infested and gypsy moth has been reported from 18 other States.

The spruce budworm defoliated trees on approximately 4.4 million acres in 1981, 2 million less than in 1980 (fig. 2). In Maine, the intensity of the outbreak has lessened since the peak of 1978; in Wisconsin and Michigan populations nearly collapsed. Spruce budworm defoliation trends are summarized in table 2.

Southern pine beetle continued to decline from the tremendously damaging levels of 1979. Beetle activity was minimal throughout the South during the summer of 1981. Only a few outbreak counties were identified (fig. 3) compared with 245 counties in 1980.

Root and stem decay fungi caused the major losses to eastern hardwoods. Other hardwood disease problems of concern included beech bark disease, which spread southward to Pennsylvania, New Jersey, and West Virginia; declines of cottonwood in Oklahoma and oak in Texas; and Dutch elm disease, which has continued to kill forest and urban elms.

Fusiform rust and annosus root rot were damaging diseases of loblolly and slash pine plantations in the South. The European strain of Scleroderris canker has been of particular concern because of potential impacts to pine outside its present range in New York, Vermont, and Maine.

In Southeastern nurseries, successful inoculation of the mycorrhizal fungus, Pisolithus tinctorius, has enhanced seedling growth and survival. Conversely, a variety of disease-causing fungi caused substantial tree seedling losses. Finally, a seed fungi survey of slash pine seed orchards showed that seed from all orchards had internal fungi. The effects of this is being evaluated.

Western Conditions

The western spruce budworm and the mountain pine beetle were the most damaging insect pests in forests of the Western United States this year.

Western spruce budworm defoliation occurred on about 4.59 million acres in 1981 (table 3). Infested areas of Arizona, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming are shown in fig. 4.

Mountain pine beetle killed lodgepole, ponderosa, and other pines on 4.41 million acres of forests in the Western United States. A series of

special inventories using multiphase sampling techniques were conducted to obtain refined estimates of mountain pine beetle caused mortality in areas where epidemics exist. These data are presented in tables 4 and 5. Table 6 summarizes the information for lodgepole and ponderosa pine. Epidemic areas are shown in fig. 5.

Dwarf mistletoes and root pathogens caused the most damage to western conifers. Foliage diseases were numerous and widespread in several areas. Rust diseases were of local significance. Greater availability of white pine blister rust-resistant planting stock has allowed resource managers greater flexibility in managing forest stands where this disease is a problem.

Forest Insect and Disease Conditions by Region

NORTHERN REGION (R-1)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Lodgepole pine, ponderosa pine, and other pines	Idaho, Montana, Wyoming	Epidemics exist on the Gallatin, Kootenai, Lolo, Beaverhead, and Flathead National Forests and in Glacier and Yellowstone National Parks. In 1981 beetle infestations covered 2.3 million acres of lodgepole pine type, 76,000 acres of ponderosa pine, 10,000 acres of whitebark pine, and 9,000 acres of western white pine. The outbreak is subsiding in several areas where epidemics have been active for 6 or more years due to host depletion.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	Idaho, Montana	Increased Douglas-fir beetle mortality occurred throughout the Region in 1981. Over 3,000 acres of infestation were detected, accounting for about 2 million board feet of lumber. Greatest activity in Idaho was on the Clearwater and Nezperce National Forests. In Montana, greatest losses occurred on the Gallatin, Flathead, Kootenai, and Deerlodge National Forests. Severe winds in November caused extensive blowdown in Idaho and is expected to trigger outbreaks in 1982 and 1983.
Spruce beetle *Dendroctonus rufipennis* (Kby)	Englemann & other spruces	Idaho, Montana	Relatively small, isolated infestations were detected on the Idaho Panhandle, Flathead, and Kootenai National Forests; Glacier National Park; Flathead Indian Reservation, and Stillwater State Forest. More than 4,000 acres are infested. Epidemics are expected to persist in 1982.
Pine engraver beetle *Ips pini* (Say)	Pines	Idaho, Montana	About 2,500 acres of pine engraver mortality was detected in the Region. Most of this occurs on the Bitterroot and Lolo National Forests, Northern Cheyenne Indian Reservation, and the Mica State Forest.
Western balsam bark beetle *Dryocoetes confusus* Swaine	Subalpine fir	Idaho, Montana	Low levels throughout Region. An estimated 2,300 acres, mainly on the Beaverhead and Flathead National Forests and Glacier National Park.
Western spruce budworm *Choristoneura occidentalis* Free.	Douglas-fir, true firs	Idaho, Montana, Wyoming	Budworm population continued to be at a relatively low level (932,000 acres visible defoliation) in 1981. A significant increase (370,000 acres) occurred on the Beaverhead National Forest. A decrease of 400,000 acres of defoliation occurred on the Gallatin National Forest. Populations are at very low levels in northern Idaho.
A budworm *Argyrotaenia* sp. near *gogana* (Kft.)	Hemlock and other conifers	Idaho, Montana	This outbreak collapsed in 1981 due to natural factors. No new defoliation observed.
Douglas-fir tussock moth *Orgyia pseudotsugata* McD.	Douglas-fir, true fir, spruce	Idaho, Montana	Remained very low in 1981. No defoliation was observed; however, moth catches in population assessment, pheromone baited survey traps increased sharply from 1980, indicating that population levels are probably increasing.

[1] Includes forests in Montana, northern Idaho, North Dakota, northwestern South Dakota, and National Park Service lands in northwestern Wyoming.

NORTHERN REGION (R-1)

Insect	Host	Location	Remarks
Forest tent caterpillar *Malacosoma disstria* (Hub.)	Aspen	North Dakota	Very low levels in 1981.
Larch casebearer *Coleophora laricella* Hbn.	Larch	Idaho, Montana	Very low levels in 1981.

Disease	Host	Location	Remarks
Stem and Branch			
Dwarf mistletoes			
Arceuthobium americanum Nutt. ex Engelm.	Lodgepole pine	Idaho, Montana	Nearly 47 million cubic feet of lodgepole pine, Douglas-fir, and western larch growth is lost annually on lands of all ownerships in Montana and northern Idaho. Infested area in the two States is about 3.1 million acres.
Arceuthobium douglasii Engelm.	Douglas-fir	Idaho, Montana	
Arceuthobium laricis (Piper) St. John	Western larch	Idaho, Montana	
White pine blister rust *Cronartium ribicola* Fisch.	Western white pine	Idaho, northwestern Montana	The rust resistance breeding program continues to improve, with more western white pine seed collected each year from disease resistant orchards. Risk of rust infection apparently varies with site conditions; in some low risk areas, naturally occurring white pine can be grown successfully. Techniques for risk rating individual stands are being refined.
Comandra blister rust *Cronartium comandrae* Pk.	Lodgepole pine	Montana	Cankers are especially prevalent on the Beaverhead National Forest, where for years they have been mistakenly identified as porcupine damage. The disease appears to be much more widespread in southwestern Montana than was previously believed.
Root Disease			
Laminated root rot *Phellinus weirii* (Murr.) Gilbn.	Douglas-fir, grand fir, western redcedar, other conifers	Idaho, Montana	Root diseases are probably the most important long-term disease problems in the Northern Region's forests. Root disease/bark beetle complexes account for significant annual mortality in mixed conifer stands throughout the Region. Losses are especially severe in Douglas-fir and grand fir stands which have a logging history. Presence of bark beetles and root pathogens, which interact to cause tree mortality, makes recognition and treatment of root disease difficult. *Phellinus weirii* and *Armillariella mellea* are commonly associated with Douglas-fir beetle on Douglas-fir and fir engraver on grand fir. Black stain root disease of ponderosa pine is often associated with western pine beetle attacks. *P. weirii* and *A. mellea* are also killing seedlings in planted or naturally regenerated stands centered around old infected stumps from the previous stand.
Shoestring root rot *Armillariella mellea* (Vahl. ex Fr.) Karst.	Douglas-fir, other conifers	Idaho, Montana	
Black-stain root disease *Ceratocystis wageneriі* Goheen & Cobb	Douglas-fir, lodgepole pine, ponderosa pine	Idaho, Montana	
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Ponderosa pine, western hemlock, subalpine fir	Idaho, Montana	
Brown cubical butt rot *Phaeolus schweinitzii* (Fr.) Pat.	Douglas-fir, other conifers	Idaho, Montana	
Foliage Disease			
Larch needle cast *Hypodermella laricis* Tub. *Meria laricis* Vuill.	Western larch	Idaho, Montana	Trees of all ages were affected. Disease incidence was widespread throughout the larch range. Damage was most severe in the lower crown; small trees were often completely defoliated. Scattered small trees were killed on the Idaho Panhandle and Clearwater National Forests in northern Idaho. High inoculum levels may result in continued damage for the next few years, especially if spring weather is cool and wet.
Red band needle blight *Dothistroma pini* Hulbary	Ponderosa pine, lodgepole pine, western white pine	Idaho	Especially prominent along the Lochsa River on the Clearwater National Forest. The outbreak was likely associated with the extended cool, wet spring of 1981.

NORTHERN REGION (R-1)

Disease	Host	Location	Remarks
Lophodermium needle cast *Lophodermium pinastri* (Schrad. ex Hook.) Chev.	Scots pine	Idaho, Montana	Showed up in several Christmas tree plantations. Identification is tentative, but it is apparently the same organism as the one causing curtailment of Scots pine production by growers in Oregon and Washington. Damage levels are not known.
Miscellaneous needle casts			
Rhabdocline pseudotsugae Syd.	Douglas-fir	Idaho, Montana	Incidence of these three needle casts was widespread in 1981 and probably related to cool, wet spring weather.
Elytroderma deformans (Weir) Darker	Ponderosa pine	Idaho, Montana	
Lophodermella concolor (Dearn.) Dark.	Lodgepole pine	Idaho, Montana	
Hardwood leaf spots *Venturia macularis* (Fr.) Mueller & Arx *Cibornia whetzelii* Seaver *Marssonina populi* (Lib.) Magn. *Melampsora populnea* (Pers.) Karst.	Aspen, black cottonwood, eastern cottonwood	Montana	These leaf spots were widespread and severe throughout the State, especially in aspen. Aspen clones varied significantly in disease severity.
Nursery Diseases			
Sirococcus tip blight *Sirococcus strobilinus* Pruess.	Ponderosa pine	Idaho	Has caused losses in more than 20,000 seedlings (16 to 20 percent of stock) over the past 2 years in two private nurseries near Bonners Ferry.
Pythium root disease *Pythium aphanidermatum* (Edson) Fitzp. *P. ultimum* Trow	Douglas-fir, grand fir	Idaho	Found on 2-0 seedlings at the Coeur d'Alene Nursery. Affected trees were grouped at the ends of several beds which had been flooded prior to symptom development.
Grey mold *Botrytis cinerea* Pers. ex Fr.	Western larch, lodgepole pine	Idaho	Occurred in container-grown seedlings at the Coeur de'Alene Nursery.
Larch needle casts *Hypodermella laricis* tub. and *Meria laricis* Vuill.	Western larch	Montana	Larch seedlings from a private nursery near Libby were heavily infected. Growth reduction may cause a higher than normal number of seedlings to be culled.
Rhizoctonia sp.	Spruce	Montana	Causing a tip rot of spruce germlings in a Christmas tree nursery north of Flathead Lake. Origin of the fungus is unknown. This is believed to be a new record of occurrence.

ROCKY MOUNTAIN REGION (R-2)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Lodgepole pine ponderosa pine	Colorado, South Dakota, Wyoming	Populations are declining in the Black Hills except on the Bear Lodge Ranger District. The outbreak in the Colorado Front Range is at a low level. Mountain pine beetle is increasing in most of the lodgepole pine type in Colorado; tree loss is especially noticeable in the vicinity of Dillon and Minturn. In Wyoming, the infestation near Lander and DuBois is static at a moderate loss level. Areas of increase include DuNoir Basin, Casper Mountain, and Green Mountain.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	Colorado, Wyoming	Scattered Douglas-fir beetle infestations were detected in the Bighorn Mountains and in Colorado.
Spruce beetle *Dendroctonus rufipennis* (Kirby)	Spruce	Colorado	Two areas of spruce beetle outbreak occur in Colorado; one at Rabbit Ears Peak and the other at Crystal Lakes. Populations in both cases resulted following windthrow in Engelmann spruce.
Pine engraver beetles *Ips* spp.	Ponderosa pine, pinyon pine, lodgepole pine	South Dakota, Wyoming, Kansas, Colorado	*Ips* beetles occurred in and around recently thinned stands and stands associated with fire.
Red turpentine beetle *Dendroctonus valens* LeC.	Ponderosa pine	Colorado, South Dakota	Turpentine beetle has been found on the Manitou Experiment Forest and in the Black Hills in association with timber harvesting. Tree mortality due to this insect has not been observed.
Western balsam bark beetle *Dryocoetes confusus* Swaine	True fir	Colorado	Tree loss of alpine fir continues throughout its range in Region 2. Western balsam beetle seems to be closely associated with root decays.
Western spruce budworm *Choristoneura occidentalis* Free.	Douglas-fir, white fir	Colorado, Wyoming	In 1981, 1,768,000 acres were infested. The following shows the acres infested by State and infestation intensity. Light / Mod-Heavy / Severe Colorado: 300,000 / 1,300,000 / 110,000 Wyoming: 100,000 / 48,000
Jack pine budworm *Choristoneura pinus* Free.	Jack pine	Nebraska	Populations remain at low levels after suppression in 1980.
Douglas-fir tussock moth *Orgyia pseudotsugata* McD.	Spruce	Colorado	Found mainly on ornamental spruce throughout the Denver metropolitan area.
Western tent caterpillar *Malacosoma californicum* (Packard)	Aspen	Colorado	Infestation first reported in 1976. In 1981, 27,000 acres were infested on the San Juan National Forest. Some tree mortality has occurred.
Pine butterfly *Neophasia menapia* (Felder & Felder)	Ponderosa pine	Colorado	Low level populations detected in Colorado.
Ponderosa pine needleminer *Coleotechnites ponderosae* H. & S.	Ponderosa pine	Colorado	An infestation caused light defoliation to about 50 percent of the ponderosa pine along the Colorado Front Range and Uncompahgre Plateau in southwestern Colorado. Some defoliation spots were detectable from the air.

[1] Includes National Forests in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming.

ROCKY MOUNTAIN REGION (R-2)

Insect	Host	Location	Remarks
Cooley spruce gall aphid *Adelges cooleyi* (Gillette)	Spruce	Colorado	Detected mostly in ornamentals in Colorado.
Zimmerman pine tip moth *Dioryctria zimmermani* (Grote)	Austrian pine, ponderosa pine, Scots pine	Nebraska, Kansas, Colorado	Occurs extensively in ornamentals and shelterbelts. The impact in shelterbelts has not been determined.
Pine tip moths *Rhyacionia* sp.	Austrian pine, ponderosa pine, Scots pine	Kansas	Occurs in nursery (Christmas tree) and ornamental trees.
Rhyacionia neomexicana (Dyar)	Ponderosa pine	Colorado	Occurs in nursery (Christmas tree) and ornamentals.
Pitch nodule moth *Petrova* sp.	Austrian pine, ponderosa pine	Kansas, Colorado	A light infestation was discovered in plantations at the Air Force Academy. The infestation is decreasing.

ROCKY MOUNTAIN REGION (R-2)

Disease	Host	Location	Remarks
Stem and Branch			
Dwarf mistletoe *Arceuthobium americanum* Nutt. ex Engelm..	Lodgepole pine	Colorado, Wyoming	Continues to be a damaging pest throughout much of the host type.
Comandra blister rust *Cronartium comandrae* Pk.	Lodgepole pine	Wyoming	A cooperative study with Colorado State University showed heavily infected lodgepole had significantly fewer cones and seed because the disease reduced crown size.
Thyronectria canker *Thyronectria austro-americana* (Speg.) Seeler	Honeylocust	Colorado, Kansas	An increasing problem for ornamental plantings in Colorado and Kansas shelterbelts.
Limb rust *Peridermium filamentosum* Pk.	Ponderosa pine	Colorado	Spotty occurrences in the Roosevelt, Arapaho, Pike, San Isabel, and Uncompahgre National Forests.
Ash heart rot *Fomes fraxinophilus* (Peck) Sacc.	Green ash	Great Plains	An extensive survey of Nebraska, encompassing 360 plots in 64 counties, revealed the disease in 86 percent of the counties. Over 1,000 trees are presently infected.
Root Disease			
Shoestring root rot *Armillariella mellea* (Vahl. ex Fr.) Karst.	All conifers	Colorado, Wyoming, South Dakota	The most common root disease in the Region. Based on a photographic survey, approximately 45,600 trees were killed in 1981 by *A. mellea* in association with mountain pine beetle.
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Subalpine fir, white fir	Colorado	This disease, occurring in association with *A. mellea* and the western balsam bark beetle on subalpine fir, was confirmed in 3 new locations in southern Colorado.
Black-stain root disease *Ceratocystis wageneriі* Goheen & Cobb	Pinyon pine	Western Colorado	This disease is continuing unabated in southwestern Colorado.
Foliage Disease			
Pine needlecasts *Lophodermella cerina* (Dark.)	Lodgepole pine	Wyoming	Approximately 200 acres showing severe defoliation on the Medicine Bow National Forest. Damaged appeared about 1 year after severe hail damage.
Lophodermium sp.	Ponderosa pine	South Dakota	Occurring throughout eastern Black Hills from Deadwood south to Custer and east to Rapid City. This fungus, fruiting on pine litter, has not been previously reported from these areas and has not been observed during the past 19 years. It appears the disease has affected some trees for several years. Trees show poor vigor, but no mortality has been seen.
Naemacyclus sp.	Ponderosa pine	Colorado	Several trees affected around a work center near Redfeather Lakes.
	Scots pine	South Dakota	Sioux Falls.
Diplodia tip blight *Diplodia pinea* (Desm.) Kickx.	Ponderosa pine	South Dakota	Occurring primarily along eastern edge of the Black Hills with scattered locations around Spearfish and Hot Springs. Scattered distribution suggests disease may be native and not introduced.
		Nebraska	Now reported from 54 counties.

ROCKY MOUNTAIN REGION (R-2)

Disease	Host	Location	Remarks
Aspen shoot blight *Venturia populina* (Vuill.) Fabric.	Aspen	Colorado	Approximately 2,000 acres in northern Colorado south of Toponas and west side of Rabbit Ears Pass. Damage was quite extensive on the edges of mature stands.
Elytroderma deformans (Weir) Dark.	Ponderosa pine	Colorado, South Dakota	Most common on the Salida Ranger District, San Isabel National Forest.
Phomopsis blight *Phomopsis juniperovora* Hahn	Junipers	Colorado	Numerous ornamental junipers showed evidence of damage near Glenwood Springs.
Rhizosphaera needlecast *Rhizosphaera kalkhoffii* Bubak	Spruce	South Dakota	A problem statewide on ornamental plantings.
Conifer-aspen rust *Melampsora medusae* Thuem.	Aspen	Colorado	Approximately 2 acres where disease was noticeable in Canon City.
	Cottonwood	Kansas	Very common in the eastern third of State.
Marssonina blight *Marssonina populi* (Lib.) Magn.	Aspen	Colorado	Extensive acreage (10,000) was infected near Paonia.
Elm anthracnose *Gnomonia ulmea* (Schw. ex Fr.) Thuem.	Elm	South Dakota, Colorado, Nebraska, Kansas	Scattered occurrences throughout all States.
Red band needle blight *Dothistroma pini* Hulbary	Ponderosa pine	South Dakota	Minor occurrences in ornamentals in Trent.
	Austrian pine	Nebraska	Infections in 1981 of experimental plantings on the Horning State Farm, Platsmouth, were extremely high.
Sirococcus tip blight *Sirococcus strobilinus* Preuss.	Spruce	South Dakota	Minor occurrences in ornamentals in Sioux Falls.
Vascular Wilts			
Dutch elm disease *Ceratocystis ulmi* (Buism.) C. Mor.	Elm species	Colorado, Nebraska, Kansas	Of the 122 Colorado areas with significant elm populations, 62 are conducting sanitation programs. In 1981, State pathologists confirmed 789 DED cases in 65 of the 122 areas.
Pine wilt disease *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle	Austrian pine, white pine, Scots pine	Nebraska, Kansas, South Dakota	Yankton County, South Dakota, is a new report for this nematode.
Nursery Diseases			
Grey mold *Botrytis cinerea* Pers. ex Fr.	Scots pine, ponderosa pine	South Dakota, Colorado	A persistent problem in all nurseries. Can be controlled chemically.
Phoma sp.	Conifers	Nebraska	Has been a serious problem after root-pruning lodgepole pine and ponderosa pine.
Damping-off	Conifers	Colorado	One nursery lost more than 80 percent of bareroot stock to *Fusarium* spp.

ROCKY MOUNTAIN REGION (R-2)

Disease	Host	Location	Remarks
Cortical stem rot *Fusarium avenaceum* (Fr.) Sacc.	Pinyon, ponderosa pine, Douglas-fir	Colorado	Containerized stock in several nurseries has experienced up to 70 percent infection but only 4-7 percent mortality.
Crown gall *Agrobacterium tumefaciens* (E.F. Smith & Towns.) Conn.	Redcedar	South Dakota	An unusually high incidence was noted in a bareroot nursery.
Abiotic	Ponderosa pine	Colorado	Because of improper overwintering storage procedures, 124,880 trees died 3 days after being planted.

SOUTHWESTERN REGION (R-3)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Ponderosa pine	Arizona, New Mexico	Mountain pine beetle remains at low levels, but activity is slowly increasing.
Western pine beetle *Dendroctonus brevicomis* LeC.	Ponderosa pine	Arizona, New Mexico	Ponderosa pine mortality due to this bark beetle increased on the Coconino and Kaibab National Forests, Arizona, and scattered tree mortality occurred throughout the rest of central Arizona and New Mexico.
Pine engraver beetles *Ips* spp.	Pines	Arizona, New Mexico	Concentrated mortality occurred on the San Carlos Indian Reservation and on the Carson, Prescott, and Apache-Sitgreaves National Forests. Scattered mortality occurred throughout the rest of the Region.
Spruce beetle *Dendroctonus rufipennis* (Kirby)	Engelmann spruce	Arizona, New Mexico	Small isolated spots occurred on the Carson and Apache-Sitgreaves National Forests. Approximately 7,000 acres of infestation were detected during aerial detection surveys on the Fort Apache Indian Reservation.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	New Mexico	Scattered single tree and small group mortality.
Scolytus beetles *Scolytus* spp.	Douglas-fir, true fir	Arizona, New Mexico	Scattered infestations of 1-10 trees throughout the Region. Heavy, localized mortality on San Francisco Peak, Coconino National Forest.
Cedar bark beetles *Phloeosinus* spp.	Arizona cypress	Arizona	Attacked an Arizona cypress plantation, Prescott National Forest.
Red turpentine beetle *Dendroctonus valens* LeC.	Ponderosa pine	Arizona	Widely scattered activity in the Region.
Western spruce budworm *Choristoneura occidentalis* Free.	Douglas-fir, true firs, spruces	Arizona, New Mexico	Acres visibly defoliated increased from 299,000 in 1980 to 477,960 in 1981. Areas with heaviest defoliation are Kaibab National Forest and Grand Canyon National Park in Arizona and Carson, Santa Fe, and Cibola National Forests in New Mexico.
Western tent caterpillar *Malacosoma californicum* (Pack.)	Aspen	Arizona, New Mexico	Defoliation continued for the sixth consecutive year and was less extensive, but new areas of defoliation appeared on the Santa Fe National Forest. Scattered defoliation also occurred on the Cibola, Carson, Kaibab, and Coconino National Forests and on the Fort Apache, Santa Clara, and Taos Indian Reservations.
Pandora moth *Coloradia pandora* Blake	Ponderosa pine	Arizona	Defoliation of 18,700 acres of ponderosa pine occurred near Jacob Lake, Arizona, on the Kaibab National Forest.
Pine budworm *Choristoneura lambertiana ponderosana* Obrat.	Ponderosa pine	New Mexico	Moderate, localized defoliation occurred on the Los Alamos National Laboratory and adjacent Santa Fe National Forest.
Pine needle miner *Coleotechnites* spp.	Ponderosa pine	Arizona, New Mexico	There was a dramatic increase in visible damage this year.

[1] Includes forests in Arizona and New Mexico and National Park Service land in western Texas.

SOUTHWESTERN REGION (R-3)

Insect	Host	Location	Remarks
Sawflies Neodiprion spp.	Pinyon, ponderosa pine, Douglas-fir	Arizona, New Mexico, Texas	Localized or single trees were affected. The defoliated Douglas-fir was detected in Guadalupe National Park, Texas.
Tiger moth Halisidota spp.	Pinyon, ponderosa pine	Arizona, New Mexico	Scattered activity in central Arizona and southern New Mexico.
Scarab beetles Phyllophaga spp.	Cottonwood	Arizona	Localized defoliation on San Simon Reservoir Area, BLM, Safford, Arizona.
Spindle gall midges Cecidomyiidae	Ponderosa pine	Arizona	Samples sent from Coconino National Forest had midge larvae, and the needles exhibited symptoms similar to those caused by the pinyon spindle gall midge.

SOUTHWESTERN REGION (R-3)

Disease	Host	Location	Remarks
Stem and Branch			
Dwarf mistletoes			
Arceuthobium vaginatum subsp. *crypotopodum* (Engelm.) Hawks. and Wiens.	Ponderosa pine	Arizona, New Mexico	Dwarf mistletoes continued to have the greatest impact on yield of conifers in the Southwest.
Arceuthobium douglasii Engelm.	Douglas-fir	Arizona, New Mexico	
Arceuthobium microcarpum (Engelm.) Hawks. and Weins.	Engelmann spruce	Arizona, New Mexico	
Root Disease			
Shoestring root rot *Armillariella mellea* (Vahl. ex Fr.) Karst.	Ponderosa pine	New Mexico	Surveyed 495 acres of a ponderosa pine stand on Jemez Ranger District on Santa Fe National Forest. Approximately 2 percent of the area was found to be out of production. Ten percent of the remaining sawtimber volume was killed; 12 percent of the sapling and poletimber was killed, and 1 percent of the seedlings were killed.
Vascular Wilts			
Pinewood nematodes *Bursaphelenchas xylophilus* (Steiner & Buhrer) Nickle	Aleppo pine	Arizona	The nematode was discovered in one county in southern Arizona. There is no evidence of the pest spreading to other counties.
Nursery Diseases			
Fusarium spp.	Ponderosa pine	New Mexico	Soil at Albuquerque Tree Nursery sampled before and after fumigation. Pathogen propagules/gram of soil significantly decreased after fumigation. In addition, there was a significantly higher tree density in the fumigated sections compared to that in the unfumigated sections.
Abiotic			
Winter damage	Ponderosa pine, white fir	Arizona, New Mexico	Freeze damage to needles found at following location: Sierra Vista Ranger District, Coronado National Forest, Arizona; Reserve Ranger District, Gila National Forest, New Mexico; Cuba Ranger District, Santa Fe National Forest, New Mexico. Winter drying on Elden Ranger District, Coconino National Forest, Arizona.

INTERMOUNTAIN REGION (R-4)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Lodgepole pine, ponderosa pine, other pines	Idaho, Utah, western Wyoming	Mountain pine beetle killed 1.14 million trees on 874,000 acres in 1981. For the first time in many years, mountain pine beetle epidemics showed a definite downward trend in southern Idaho. Infested acreage in Idaho decreased from 730,000 acres in 1980 to 650,000 acres in 1981. However, infestations in western Wyoming and Utah built up rapidly, with subsequent heavy mortality. On the Ashley National Forest, mortality increased from 65,000 trees in 1980 to 350,000 trees in 1981. Generally, the lodgepole pine on the north slope of the Uinta Mountains sustained heavy mortality from the beetle.
Jeffrey pine beetle *Dendroctonus jeffreyi* Hopk.	Jeffrey pine	Nevada	Increases in tree mortality were observed on the Carson and Bridgeport Ranger Districts, Toiyabe National Forest, around Markleeville, California, and on the east shore of Lake Tahoe.
Spruce beetle *Dendroctonus rufipennis* (Kby.)	Engelmann spruce	Utah	Increasing populations of spruce beetle on the Uinta National Forest occurred on 2,000 acres of overmature spruce from Mill Hollow to Soapstone Basin.
Western balsam bark beetle *Dryocoetes confusus* Swaine	Subalpine fir	Idaho, Nevada, Utah, Wyoming	Fir mortality continued to increase, with over 200,000 acres affected regionwide in 1981. This mortality is caused by a complex of root rots and *Dryocoetes*.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	Idaho, Utah	Low levels throughout Region.
Pine engraver beetle *Ips pini* (Say)	Pines	Idaho, Nevada, Utah	Low levels throughout Region.
Western spruce budworm *Choristoneura occidentalis* Free.	True firs, Douglas-fir, western larch, spruce	Idaho, Utah, Wyoming	Over 1.5 million acres were defoliated regionwide in 1981. The Boise, Caribou, Payette, and Sawtooth National Forests all experienced increased defoliation. Defoliation was recorded for the first time near Logan, Utah, on the Wasatch-Cache National Forest. Infestations increased on the Fishlake and Dixie National Forests.
Larch casebearer *Coleophora laricella* (Hbn.)	Western larch	Idaho	Widespread defoliation throughout the larch type on the Boise and Payette National Forests.
Pine butterfly *Neophasia menapia* (Felder & Felder)	Ponderosa pine	Idaho	Light to moderate defoliation over a small area on the Boise National Forest.
Needle miner *Coleotechnites*, sp.	Ponderosa pine	Idaho	Present on over 1,900 acres on the Salmon National Forest.
Douglas-fir tussock moth *Orygia pseudotsugata* (McD.)	Douglas-fir, spruce	Idaho	Light to moderate defoliation occurred on approximately 160 acres in the Owyhee Mountains.
Forest tent caterpillar *Malacosma disstria* Hbn.	Aspen	Idaho	Light to moderate defoliation occurred on approximately 35 acres along Cascade Reservoir.

[1] Includes forests in southern Idaho, Nevada, Utah, and western Wyoming.

INTERMOUNTAIN REGION (R-4)

Disease	Host	Location	Remarks
Stem and Branch			
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, western larch, ponderosa pine, lodgepole pine	Idaho, Utah, Wyoming, Nevada	These pests continued to have significant impacts on growth and yield of the host species throughout the Region.
Atropellis canker *Atropellis piniphila* (Weir) Lohman and Cash	Lodgepole pine	Idaho	Three new infection areas were identified on the Boise and Payette National Forests. Localized heavy infections.
Dasyscypha canker *Dasyscypha* sp.	Lodgepole pine	Idaho	Cankers caused top-kill on lodgepole pine seedlings in several plantations in southeastern Idaho.
Comandra rust *Cronartium comandrae* Pk.	Lodgepole pine	Idaho, Utah, Wyoming	Cankers caused top-kill in lodgepole pine on the Targhee, Bridger-Teton, and Ashley National Forests.
Cytospora canker *Cytospora chrysosperma* (Pers.) F.	Aspen, hybrid poplar	Idaho, Utah	Cankers were found killing young aspen in the Sawtooth NRA, Idaho, and hybrid poplar at Monroe Hot Springs, Utah.
Root Disease			
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Ponderosa pine, Douglas-fir, true fir	Idaho, Utah Wyoming, Nevada	Detections of annosus infections increased throughout the Region.
Shoestring root rot *Armillariella mellea* (Vahl. ex Fr.) Karst.	Subalpine fir, Engelmann spruce, ponderosa pine, lodgepole pine	Utah, Wyoming	This fungus was found killing subalpine fir and Engelmann spruce on the Dixie National Forest, ponderosa pine on the Manti-LaSal National Forest, and lodgepole pine on the Bridger-Teton National Forest.
Red root butt rot *Inonotus tomentosus* (Fr.) Gilbn.	Douglas-fir	Idaho	Often isolated from decayed roots of beetle-killed Douglas-fir.
Red-brown butt rot *Phaeolus schweinitzii* (Fr.) Pat.	Douglas-fir	Idaho	Often isolated from decayed roots of beetle-killed Douglas-fir.
Foliage Disease			
Leaf spot of poplars *Marssonina populi* (Lib.) Magn.	Poplars	Idaho, Utah, Wyoming	Infection levels were locally heavy, but varied from area to area and by clone.
Leaf rust *Melampsora* spp.	Poplars, conifers	Idaho	Spotty occurrence throughout southwestern Idaho.
Leaf spot *Septoria aceris* (Lib.) Berk. & Br.	Maple	Idaho	Heavily infected area on Payette National Forest.
Needle cast of pine *Elytroderma deformans* (Weir) Dark.	Ponderosa pine, lodgepole pine	Idaho	Light-to-heavy infection levels were observed in west-central Idaho.
Red band needle disease *Scirrhia pini* Funk and Parker	Ponderosa pine	Idaho	Identified on ponderosa pine in southwestern Idaho. This is the first report of the organism in the Intermountain Region.
Meria needle disease *Meria laricis* Vuill.	Western larch	Idaho	Heavy infection levels occurred within the host range on the Payette and Boise National Forests. Levels were up from last year.

INTERMOUNTAIN REGION (R-4)

Disease	Host	Location	Remarks
Greybeard needle disease *Lophodermium* spp.	Ponderosa pine, lodgepole pine	Idaho	Infections locally heavy in southwest Idaho.
Lodgepole needle disease *Lophodermella concolor* (Dearn.) Dark.	Lodgepole pine	Idaho	Scattered low-level infections in Idaho.
Pine needle rust *Coleosporium asterum* (Diet.) Syd.	Lodgepole pine	Idaho	Low levels scattered throughout type.
Christmas tree blight *Rhabdocline pseudotsugae* Syd.	Douglas-fir	Idaho	Low levels throughout type.
Snow blight *Phacidium infestans* Karst.	Douglas-fir	Idaho	Infrequent in southeastern Idaho.
Needle cast *Lirula abietis-concoloris* (Mayr. ex Dearn.) Dark.	Firs	Idaho, Utah	Local heavy occurrence in southwestern Idaho and Utah.
Needle rust *Pucciniastrum* spp.	Firs	Idaho	Local heavy occurrence in southwestern Idaho.
Abiotic			
Late frost	Douglas-fir, grand fir, subalpine fir, lodgepole pine	Idaho	Freezing temperatures on July 8, 1981, affected young succulent tissues. New leaders were drooped and misshapened. Branch tip mortality occurred, resembling symptoms of western spruce budworm damage.

PACIFIC SOUTHWEST REGION (R-5)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Sugar, ponderosa, lodgepole pines	Northern and central California	In general, infestations were widely scattered. Numerous lodgepole pines were killed in campgrounds, Fresno County. Attacks increased in overstocked ponderosa pine plantations, Modoc County. Attacks were associated with pine engravers in dense stands of ponderosa pine poles and saplings, Siskiyou County.
Pine engraver beetles *Ips* spp.	Pines	California, statewide	Serious group killing of young plantation pines occurred in Los Angeles County. Top killing of larger trees was observed in Amador and El Dorado Counties. Scattered group kills were found in Siskiyou County.
Fir engraver *Scolytus ventralis* LeC.	Firs	Northern and central California	The most serious mortality was on the east side of the Cascade-Sierra crest, where long-term fire exclusion allowed fir to replace pine on pine sites. Other reports of activity were in El Dorado, San Bernardino, and Siskiyou Counties.
Western pine beetle *Dendroctonus brevicomis* LeC.	Ponderosa pine, Coulter pine	California, statewide	Activity remained low in 1981. One small outbreak appeared in Siskiyou County.
Red turpentine beetle *Dendroctonus valens* LeC.	Pines	California, statewide	Activity was scattered and on individual trees. There were no new concentrated infestations.
Jeffrey pine beetle *Dendroctonus jeffreyi* Hopk.	Jeffrey pine	California, statewide	Tree mortality continued in Lassen Volcanic National Park and adjacent areas of Lassen National Forest. Other areas of tree mortality were near Adin and Eagle Lake, Lassen County, and Upper Boulder Creek, Plumas County. Beetles also were active in campgrounds in Fresno and San Bernardino Counties.
California flatheaded borer *Melanophila californica* Van Dyke	Pines	Southern California	Significant activity was confined to Jeffrey pine in San Diego and San Bernardino Counties.
Flatheaded fir borer *Melanophila drummondi* Kby.	Douglas-fir	Northern California	Borers belatedly killed many Douglas-firs injured by the Hog Fire of 1977 in Siskiyou County.
Gypsy moth *Lymantria dispar* (L.)	Hardwoods, ornamentals	Southern California, San Francisco Bay Area	A total of 58 adult male moths were trapped in 1981--41 in the city of Santa Barbara, 7 in Marin County, 3 each in Los Angeles and San Diego Counties, and 2 each in Santa Cruz and Ventura Counties.
Fruit tree leafroller *Archips argyrospilus* (Walker)	California black oak, other hardwoods	Southern California	The 1980 infestation of 25,000 acres in San Bernardino County declined to about 5,000 acres. Defoliation was also reported on about 2,000 acres in Tulare County.
Pandora moth *Coloradia pandora* Blake	Jeffrey pine	Southern California	No new areas of defoliation were detected. Population monitoring within the 16,000-acre infestation on the Inyo National Forest near Mammoth Lakes showed an increasing incidence of virus and an apparent decline in population levels in many areas.

[1] Includes forests in California and Hawaii.

PACIFIC SOUTHWEST REGION (R-5)

Insect	Host	Location	Remarks
Lodgepole needleminer *Coleotechnites milleri* (Busck)	Lodgepole pine	California, Yosemite National Park	Population levels fell in the Tuolumne infestation in Yosemite National Park. Increases in parasitism and starvation were contributing factors. One new area was discovered within the Park in Jack Main Canyon.
Douglas-fir tussock moth *Orgyia pseudotsugata* (McD.)	White fir	Northern and central California	No defoliation, but results from pheromone traps indicate increasing numbers in some areas.
Douglas-fir reproduction weevil *Cylindrocopturus furnissi* Buchanan	Douglas-fir	Northern California	Seedling mortality and twig damage was common, but seldom concentrated, in north coast counties.
Grasshoppers various species	Pines	Central California	Hoopers defoliated a 10-acre tree improvement plantation in El Dorado County. Aerial application of 8 ounces of malathion per acre and hand-baiting of streamside zones with carbaryl-treated bran by the Animal and Plant Health Inspection Service substantially reduced grasshopper populations and protected reforestation efforts on 1,500 acres within the Granite Burn, Stanislaus National Forest, Tuolumne County.
Ponderosa pine tip moth *Rhyacionia zozana* (Kearfott)	Pines	Central California	Scattered damage occurred on about 100 acres of plantation ponderosa pine on the Stanislaus National Forest.
Pine needle sheathminer *Zellaria haimbachi* Busck	Pines	Northern California	Larvae of this moth defoliated the current growth on about 110 acres of plantation ponderosa pine on the Klamath National Forest.
Spruce aphid *Elatobium abietinum* (Walker)	Sitka spruce	California, Redwood National Park	An infestation in Redwood National Park continued into the fourth consecutive year.
Pinyon needle scale *Matsucoccus acalyptus* Herbert.	Pinyon pine	Southern California	A severe infestation was observed on 40 acres of pinyon pine.
Eurasian pine aphid *Pineus pini* Macquart	Pine	Hawaii	While still active in Lihue, Kauai, two introduced predators, *Leucopis nigraluna* McAlpine and *L. obscura* Holiday, apparently have contained the infestation.
Acacia psyllid *Pyslla uncatoides* (Ferris & Klyver)	Koa	Hawaii	Early in the year, nearly 100 percent of the 1977 and 1978 saplings in the Keauhou koa regeneration project were infested. Later, increasing numbers of predaceous coccinellid, *Harmonia conformis* (Boisduval), caused the psyllid populations to decline.
Western yellowjacket *Vespula pennsylvanica* (Saussure)	Hawaii		Despite eradication efforts, the incidence (number of nests and individuals/nest) of this introduced wasp continues to increase and to hamper forestry activities.

PACIFIC SOUTHWEST REGION (R-5)

Insect	Host	Location	Remarks
Stem and Branch			
Dwarf mistletoes *Arceuthobium* spp.	Primarily ponderosa pine, Jeffrey pine, true fir, other conifers	California, statewide	Continued to have a major impact in commercial forest and recreation areas. Dwarf mistletoe-infected conifers occur on about 21 percent of the commercial forest land in the State.
True mistletoes *Phoradendron* spp.	Hardwoods, white fir	Southern California	Widespread infection of hardwoods in high-use campgrounds has resulted in growth reduction, increased susceptibility to drought, and depletion of vegetative cover. Heavy infection of white fir in some areas of the San Bernardino National Forest has resulted in top kill and depletion of fir in the understory.
White pine blister rust *Cronartium ribicola* Fisch.	Sugar pine	Northern and central California	Three new reports of the disease from the central and southern Sierra Nevada were part of the continuing spread and intensification of the rust in the southern Sierra that began in the mid-1960's.
Eucalyptus canker *Cryphonectria cubensis* (Bruner) Hodges	Eucalyptus	Hawaii	Remains confined to the island of Kauai. Incidence and injury appear greatest when eucalyptus, primarily *Eucalyptus saligna*, is planted in low, moist areas on the windward side of the island.
Root Disease			
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Conifers	California, statewide	Of management concern in pine and true fir stands throughout the State. Recreation site managers continue to request assistance in developing vegetative management alternatives to reduce its impact. Requests for evaluations to determine the need for borax application in timber sales continue to be received.
Black-stain root disease *Ceratocystis wagnerii* Goheen & Cobb	Pines, Douglas-fir	Northern and central California	Reports of the disease range expansion in Douglas-fir southward in both the Coast Range and the Sierra Nevada. The disease was reported on singleleaf pinyon pine for the first time in Tulare County.
Shoestring root rot *Armillariella mellea* (Vah. ex Fr.) Karst.	Koa	Hawaii	Associated with several thousand acres of deteriorating koa stands on the island of Hawaii. May be involved in poor success of koa regeneration.
Foliage Diseases			
Elytroderma disease *Elytroderma deformans* (Weir) Darker	Ponderosa pine, Jeffrey pine	California, statewide	Levels of infection have generally declined since the last periods of high infestation in the early 1970's. However, the San Bernardino National Forest has experienced a significant increase of the disease on Jeffrey pine.
Vascular Wilt			
Dutch elm disease *Ceratocystis ulmi* (Buism.) C. Mor.	Elms	Central California	Remains confined to eight San Francisco Bay Area counties. Of 275 diseased sites identified since 1975, 122 have remained free of new infections for 2 or more years.

PACIFIC SOUTHWEST REGION (R-5)

Disease	Host	Location	Remarks
Nursery Diseases			
Fusarium oxysporum (Schl.) em. Snyd. & Hans	Sugar, ponderosa, Jeffrey pines, true fir	Northern and central California	Remains the major disease problem in California nurseries. The disease was reported on sugar pine at the Humboldt and Ben Lomond nurseries, on ponderosa and Jeffrey pines at the Placerville nursery, and on sugar pine, red fir, and white fir at the Magalia Nursery.
Abiotic			
Air pollution	Ponderosa pine, Jeffrey pine	South-central California	Ozone levels in the southern Sierra Nevada were greater in 1981 than in 1980. Twenty-one of twenty-seven air pollution injury plots showed increased symptoms in 1981 compared to 1977. Ozone symptoms on ponderosa and Jeffrey pines on the Stanislaus National Forest, surveyed for the first time in 1981, are widespread, but average only slight to moderate.
Drought	Slash, loblolly pine	Hawaii	Pine death in plantations on the island of Kauai was associated with drought conditions, overstocking, and subsequent attack of roots of stressed trees by a *Botryosphaeria* sp.
Ohia decline	Ohia	Hawaii	Abiotic factors--including substrate aging, flooding, drought, and others--and biotic factors--including *Phytophthora cinnamomi* and *Plagithmysus bilineatus*--have been implicated in the decline. A biological evaluation to help develop management alternatives for the decline area near Hilo, Hawaii, was completed.

PACIFIC NORTHWEST REGION (R-6)[1]

Insect	Host	Location	Remarks
Mountain pine beetle *Dendroctonus ponderosae* Hopk.	Lodgepole, ponderosa, white, and sugar pines	Oregon, Washington	Losses continue to decline throughout the Region, especially in older areas of the outbreak in northeast Oregon. Losses in Oregon were in excess of 14.7 million cubic feet; 13.6 million of this volume was in lodgepole pine. Greatest losses in Washington were on the Colville National Forest and the North Cascades National Park. Overall regional losses were 19.6 million cubic feet compared to 25 million in 1980.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	Oregon, Washington	Douglas-fir beetle east of the Cascade Mountains increased. Infested acreage in 1981 was 10,540; this compares with 8,710 acres in 1980. A major portion of this loss occurred on the Umatilla and the Wallowa-Whitman National Forests on areas which were defoliated during the 1972-74 tussock moth outbreak and on western spruce budworm defoliated areas in north-central Washington. Acres of West Side Douglas-fir beetle activity decreased slightly. Areas near Mt. St. Helens are being closely monitored for possible Douglas-fir beetle activity.
Pine engraver *Ips pini* (Say)	Pines	Oregon, Washington	Activity of *Ips* decreased in 1981. Approximately 16,150 infested acres were mapped in 1981; 15,100 of these acres were in Oregon and 1,050 were in Washington.
Fir engraver *Scolytus ventralis* LeC.	True firs	Oregon, Washington	There was a significant increase in fir engraver activity in Oregon and Washington. 1,650 acres were infested in both Oregon and Washington.
Western pine beetle *Dendroctonus brevicomis* LeC.	Ponderosa pine	Oregon, Washington	The infested area has dropped from 52,000 in 1980 to 23,600 acres in 1981. All Forests and Indian Reservations east of the Cascades have experienced some losses. Current losses were greatest on the Fremont, Malheur, and Winema National Forests in Oregon and on the Wenatchee National Forest in Washington.
Douglas-fir engraver *Scolytus unispinosus* LeC.	Douglas-fir	Washington	Activity continues to be at a low level throughout the Region.
Ambrosia beetles various spp.	Douglas-fir, true firs	Washington	These beetles were found in scattered locations in the blast and flood damaged areas around Mt. St. Helens. Attacks were light in 1980 but increased in 1891.
Western spruce budworm *Choristoneura occidentalis* Free.	Douglas-fir, true firs, spruce	Oregon, Washington	Budworm defoliation continued to decline in Washington in 1980. Activity is the greatest on untreated areas of the North Okanogan Valley and in the North Cascades National Park. In Oregon, the area of visible defoliation increased from about 6,000 acres in 1980 to over 300,000 acres in 1981 on the Umatilla, Malheur, and Wallowa-Whitman National Forests and adjoining State and private lands.

[1] Includes forest in Oregon and Washington.

PACIFIC NORTHWEST REGION (R-6)

Insect	Host	Location	Remarks
Larch casebearer *Coleophora laricella* (Hbn.)	Larch	Oregon, Washington	High populations caused heavy defoliation in the central Oregon Cascades in 1981. Elsewhere in Oregon, populations were generally lower than last year. Populations in the Cascade Mountains of Washington showed only local variation from last year. Success of the imported parasite release program in the Blue Mountains of Oregon is becoming evident, with reduced numbers of larch casebearers at some of the earliest release sites.
Gypsy moth *Lymantria dispar* (L.)	Hardwoods	Oregon, Washington	In Washington, adult moths were trapped in Seattle, Vancouver, and on Mercer Island. In Oregon, male moths were trapped in Lake Oswego, Happy Valley, and Salem.
Balsam woolly aphid *Adelges picae* (Ratz)	Firs	Oregon, Washington	The number of infestation centers decreased from 89 in 1980 to 18 in 1981. All of the damage was on the Mt. Baker-Snoqualmie National Forest.
Spruce aphid *Elatobium abietinum* (Walker)	Spruce	Oregon, Washington	Aphid-caused defoliation increased in Oregon and Washington from 200 acres in 1980 to 2,750 in 1981.
Cone and seed insects various spp.	Douglas-fir	Oregon, Washington	Douglas-fir cone crops west of the Cascades were light and scattered during 1981; as a result, cone and seed insect impact was heavy.

PACIFIC NORTHWEST REGION (R-6)

Disease	Host	Location	Remarks
Stem and branch			
Dwarf mistletoes *Arceuthobium* spp.	Douglas-fir, larch, ponderosa pine, lodgepole pine, true fir, hemlock	Oregon, Washington	Dwarf mistletoes remain among the most serious pathogens throughout the Pacific Northwest, being particularly damaging east of the Cascade crest. Losses are slowly but steadily declining as stands are being managed more intensively.
White pine blister rust *Cronartium ribicola* Fisch.	Western white pine, sugar pine	Oregon, Washington	Most severe losses are occurring along the east side of the Cascades in Washington around Middleport and Metaline Falls in northeast Washington and along the crest of the Cascades in north Oregon. Availability of resistant planting stock is increasing.
Root Disease			
Laminated root rot *Phellinus weirii* (Murr.) Gilbn.	Douglas-fir, grand fir, white fir	Oregon, Washington	This root rot causes serious loss both west and east of the Cascade crest. Estimates suggest that 5 percent of the Douglas-fir type is removed from production by this disease. The acreage of infestation is probably closer to 10 percent. Damage is also severe in some grand and white fir stands.
Black-stain root disease *Ceratocytis wageneriі* Goheen & Cobb	Douglas-fir	Oregon, Washington	Incidence is increasing in young Douglas-fir stands and appears to be most damaging in southwestern Oregon where it is closely associated with thinning and road building.
Phytophthora root rot *Phytopthera lateralis* Tucker & Milb.	Port-Orford-Cedar	Oregon	This root rot disease continues to damage Port-Orford-Cedar stands in southwest Oregon.
Shoestring root rot *Armillariella mellea* (Vahl. ex Fr.) Karst.	Mixed fir and pine forest type	Oregon, Washington	This fungus is especially damaging in mixed fir and pine forests. Severe damage in white fir and ponderosa pine stands has been found, particularly in areas where firs have invaded former pine sites.
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Western hemlock, white fir, grand fir, lodgepole pine	Oregon, Washington	This pathogen is almost universally found in western hemlock stands where losses appear small in stands less than 120 years. In fir stands, disease incidence is higher in stands which have had some form of partial cutting. The disease was found in 11 of 19, age 5- to 19-year-old, lodgepole pine plantations in central Oregon. Damage was minor.
Foliage Disease			
Swiss needle cast *Phaeocryptopus gaumanni* (Rhode) Petr.	Douglas-fir	Oregon, Washington	Widespread throughout western Washington and northwestern Oregon. Christmas tree plantations were most severely affected. This disease is becoming increasingly common in forest stands. Excellent control is achieved by fungicide applications.
Larch needle cast *Meria laricis* Vaill. Tub.	Western larch	Oregon, Washington	This disease occurred throughout practically the entire range of larch in Oregon and Washington.
Elytroderma needle disease *Elytroderma deformans* (Weir) Darker	Ponderosa pine	Oregon, Washington	Disease incidence remains high around Republic, Washington, and in the Maury Mountains of Oregon.

PACIFIC NORTHWEST REGION (R-6)

Disease	Host	Location	Remarks
Nursery/Seed Orchard			
Fusarium oxysporum (Schl.) em. Snyd. & Hans.	Douglas-fir, pines	Oregon, Washington	This is the most common root disease of bare root conifer seedlings in Oregon and Washington.
Phytophthora root rot *Phytophthora* spp.	Sugar pine	Oregon	Phytophthora root rot has been implicated in the death of sugar pines in a southern Oregon seed orchard.
Fusarium stem canker *Fusarium roseum* (Lk.) Snyd. & Hans.	Douglas-fir	Oregon, Washington	This fungus has been isolated from stem cankers on bare root Douglas-firs from two nurseries.
Grey mold *Botrytis cinerea* Pers. ex Fr.	Douglas-fir, true firs, hemlock	Oregon, Washington	Common in container and bare root nurseries in 1981.
Abiotic			
High temperatures	Douglas-fir, true firs, cedar	Oregon, Washington	Record high temperatures in early August were responsible for widespread top killing and foliage scorch on a number of conifer species.

SOUTHERN REGION (R-8)[1] AND SOUTHEASTERN AREA

Insect	Host	Location	Remarks
Southern pine beetle *Dendroctonus frontalis* Zimm.	Pine	Southeastern United States	Southern pine beetle activity was minimal throughout the South during the summer of 1981. There were no confirmed reports of infestations in Texas, Oklahoma, Arkansas, or Louisiana. Alabama and Mississippi incurred losses during the first half of 1981 before populations plummeted. A similar pattern exists for eastern southern states where virtually all significant activity was confined to northeastern Georgia, northwestern South Carolina, and southwestern North Carolina. In the eastern South, too, most damage occurred in early 1981. Salvage volumes for South Carolina, Georgia, and North Carolina totaled 4,228 thousand cubic feet.
Ips (*Ips* spp.) and black turpentine beetle, *Dendroctonus terebrans* (Olivier)	Pine	Southeastern United States	Intense throughout South due to drought conditions which predisposed trees to attack.
Introduced pine sawfly *Diprion similis* Hartig	White pine	North Carolina, Virginia, Tennessee	Infestation increased from 6,000 to 10,000 square miles. Surveys showed that the sawfly population almost extends to the western limit of the host's (eastern white pine) range.
Texas leaf cuting ant *Atta texana* Buckley	Pine	Texas, Louisiana	Caused serious losses to pine regeneration on deep, sandy soils. Over 300,000 pine seedlings were killed.
Balsam woolly aphid *Adelges picae* (Ratz.)	Fraser fir	Southern Appalachians	Now found in virtually every significant concentration of Fraser fir in the southern Appalachians.
Webbing coneworm *Dioryctria disclusa* (Heinrich)	Pine	Southeastern United States	Losses were minimal, with most orchards experiencing bumper crops.
Southern pine coneworm *Dioryctria amatella* (Hulst.) *Dioryctria clarioralis* (Walker)	Southern pine	Southwide United States	These species continued to cause losses throughout the Southeast.
Slash pine thrips *Gnophothrips fuscus* (Morgan)	Southern pine	Florida, Georgia, and Gulf Coast	Caused damage to 1981 flower crop.
White pine cone beetle *Conopthorus coniperda* (Schwarz)	Southern pine	North Carolina	Variable damage with heavy losses at the North Carolina Forest Service's Morganton facility.
Seedbugs *Leptoglossus corculus* (Say) *Tetyra bipunctata* (H.-S.)	Southern pine	Southwide	Variable damage was most severe in untreated areas.

[1] Includes forests in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

SOUTHERN REGION (R-8) AND SOUTHEASTERN AREA

Insect	Host	Location	Remarks
Gypsy moth *Lymantria dispar* (L.)	Hardwoods	Virginia, Arkansas, South Carolina	The most significant gypsy moth activity was reported in northern Virginia, northern Arkansas, and southeastern South Carolina. In Virginia, there are five known infestations (one in Loundon County, three in Fairfax County, and one in Fauquier County). Two hundred acres were sprayed in Lunenburg County in 1981. Elsewhere in Virginia, over 20,000 male moths were trapped. In Arkansas, a well-established 5-10 acre infestation was discovered in Fulton County near the Missouri border. A potential infestation may be located in Horry County, South Carolina. In North Carolina, 55 counties have had trap catches of male moths with a number of these counties showing multiple catches. The concentration of moths has been in those counties along the coast and north of the Raleigh-Durham area. Florida had a significant increase in multiple moth catches, generally from Escambia County in the panhandle to the Tampa-Winterhaven area. Male moths were also trapped in Alabama (2 counties) and Georgia (5 counties).
Reproduction weevils Pales weevil *Hylobius pales* (Herbst) Pitch-eating weevil *Pachylobius picivorus* (Germar)	Various southern pines	Oklahoma, western North Carolina, Georgia	Severe scattered damage in several plantations. Heavy losses in western North Carolina and northern Georgia Forest Service progeny test areas.
Virginia pine sawfly *Neodiprion pratti pratti* (Dyar)	Various southern yellow pines	North Carolina, Kentucky	Locally severe.
Arkansas pine sawfly *Neodiprion taedae linearis* Ross	Southern yellow pines	Kentucky	Moderate to severe defoliation.
Redheaded pine sawfly *Neodiprion leconteii* (Fitch)	Various southern yellow pines	Virginia, Alabama, Mississippi, Texas, Kentucky	Locally severe.
Loblolly pine sawfly *Neodiprion taedae linearis* Ross	Various southern yellow pines	Mississippi, Arkansas, Louisiana	Moderate to severe defoliation.
Blackheaded pine sawfly *Neodiprion excitans* Rohwer	Loblolly pine	Texas	Moderate to heavy defoliation, but no mortality.
White pine sawfly *Neodiprion pinetum* (Norton)	Eastern white pine	Virginia	Light defoliation.
Other pine sawflies *Neodiprion* spp.	Various pines	Alabama, Texas, Mississippi, Kentucky, Virginia, North Carolina	Heavy local populations.
Bagworm *Thyridopteryx ephemeraeformis* (Haworth)	Various hardwood and softwood species	North Carolina, Virginia, Kentucky	Severe local defoliation.

SOUTHERN REGION (R-8) AND SOUTHEASTERN AREA

Insect	Host	Location	Remarks
Pine looper *Lamdina pellucideria* (G. & L.)	Virginia pine	Virginia	Populations at high levels.
Pine webworms *Tetralopha robustella* Zell.	Virginia pine, Scotch pine	Kentucky	Unusually high populations.
Cypress looper *Anacamptodes pergracillis* (Hulst.)	Cypress	Florida	Populations down in Big Cypress National Park; up dramatically (an estimated 10,000 acres defoliated) near Fish-eating Creek.
Nantucket pine tip moth *Rhyacionia frustrana* (Comstock)	Various southern yellow pines	Oklahoma, Arkansas, North Carolina, Kentucky	Caused shoot dieback in plantations.
Hemlock woolly aphid *Adelges tsugae* (L.)	Hemlock	Virginia	Spreading from light infestations.
Eastern spruce gall aphid *Adelges abietis* (L.)	Red spruce	Virginia	Light local infestations in Shenandoah National Park.
Pine leaf adelgid *Pineus pinifoliae* (Fitch)	Eastern white pine	North Carolina	Damaging where white pine and red spruce (its alternate host) occur together.
Oak leaf tier and roller *Croesia semipurpurana* (Kearfott) *Archips semiferanus* (Walker)	Oak	Kentucky, Virginia, Alabama	Light defoliation in Kentucky; heavy in Virginia and Alabama.
Forest tent caterpillar *Malacosoma disstria* Hubuer	Various hardwoods	North Carolina, Virginia, Kentucky, Louisiana, Alabama	Light to severe defoliation; 10,000 acres defoliated in eastern Virginia; Louisiana and Alabama defoliation confined to bottomlands.
Fall cankerworm complex *Alsophila pometaria* (Harris)	Various hardwoods	North Carolina, Virginia, Kentucky, Arkansas	Light to severe defoliation.
Spring cankerworm complex *Paleacrita vernata* (Peck)	Various hardwoods	Kentucky, Oklahoma, Arkansas, Virginia	Locally heavy in Kentucky; light in Oklahoma and Arkansas; severe in Prince William County, Virginia.
Eastern tent caterpillar *Malacosoma americanum* (F.)	Various hardwoods, especially black cherry	Virginia, Florida, Kentucky, North Carolina	Defoliation light to severe.
Locust leaf miner *Odontata dorsalis* (Thunberg)	Black locust	North Carolina, Virginia	Defoliation heavier than normal in most areas.
Elm leaf beetle *Pyrrhalta luteola* (Muller)	Elm	Virginia, North Carolina, Kentucky, Oklahoma	A severe shelterbreak problem in Oklahoma; moderate to heavy elsewhere.
Fall webworm *Hyphantria cunea* (Drury)	Various hardwoods, especially pecan and persimmon	Virginia, Kentucky	Generally heavy defoliation.

SOUTHERN REGION (R-8) AND SOUTHEASTERN AREA

Insect	Host	Location	Remarks
Poplar tentmaker *Ichthyura inclusa* (Hubner)	Cottonwood, willow	Louisiana	Light defoliation in natural stands.
Walnut caterpillar *Datana integerrima* Grote & Robinson	Black walnut, pecan	Kentucky, Oklahoma	Heavy local defoliation.
Walkingstick *Diapheromera femorata* (Say)	Various hardwoods	Arkansas	Localized moderate defoliation.

SOUTHERN REGION (R-8) and SOUTHEASTERN AREA

Disease	Host	Location	Remarks
Stem and Branch			
Fusiform rust *Cronartium quercuum* (Berk.) Miy. ex Shirai f. sp. *fusiforme*	Loblolly, slash pine	Wide corridor from central Louisiana to South Carolina	The most serious disease of loblolly and slash pines. Annual losses are estimated at 194 million ft^3 of growing stock. This includes 562 million bf of sawtimber. This amounts to about a 110 million dollar loss. There are over 42 million acres of slash and loblolly throughout the fusiform range, of which 13.8 million acres have at least 10 percent of the trees infected.
White pine blister rust *Cronartium ribicola* Fisch.	Eastern white pine	North Carolina, Virginia	Continues at low occurrence level at higher elevations. Eastern white pine is now being planted in areas previously restricted because of rust.
Pitch canker *Fusarium moniliforme* var. *subglutinans* (Wr. & Reink)	Virginia, slash, shortleaf, longleaf, eastern white, Scotch pine	Florida, Georgia, North Carolina, South Carolina, Tennessee, Virginia	Continues to cause losses in selected slash and loblolly pine seed orchards. The disease is common in the previously hard hit areas of Florida, but is having little impact at this time. Renewable Resources data indicate that the disease is increasing in severity in north central Florida. Other States report an endemic occurrence of the disease on a variety of pests.
Decay, primarily fungi in the Polyporaceae	Hardwoods	Southwide	The most serious disease of pole size and larger trees. Losses are especially severe on sites that have been burned or sustained damage during storms. Seems to be more of a problem on poor sites and where the occurrence of hardwood borers is high.
Cottonwood canker/decline *Cytospora* sp. and environmental stress	Cottonwood	Oklahoma	Cankering and decline of cottonwood were found along the Beaver River in Oklahoma. Twenty-two percent of the trees were in the advanced stage of decline, with 31 percent seriously cankered. The disease was more severe in 1-10" diameter size classes. The problem seems to be caused by long-term moisture stress and the altering of ground water levels.
Chestnut blight *Endothia parasitica* (Murr.) P. J. and H. W. And.	American chestnut	Throughout chestnut range	Almost complete mortality of older trees. The hypovirulent strain has been tested extensively throughout the range, with little success.
Root Disease			
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	All commercial species of southern yellow pine, white pine, other non-commercial and ornamental species	On high hazard sites throughout Southeastern United States	Continues to be a problem in thinned plantations. It is estimated that about 3 percent of loblolly and slash pine were dying or dead as a result of annosus root rot in 1981. Surveys have shown that there is a relationship between this disease and southern pine beetle.
Sand pine root disease *Armillariella tabescens* (Fr.) Sing. *Phaeolus schweinitzii* (Fr.) Pat *Inonotus circinatus* (Fr.) Gilbs *Verticicladiella procera* Kendrik *Phytophthora* sp.	Sand pine	Florida, South Carolina, Georgia	Surveys of the entire resource show disease in both races of sand pine and overall age classes and stand origin types. Overall incidence exceeds 4.5 percent of all trees. While impact on growth remains unknown, annual dollar losses to tree mortality exceed $2 million in Florida, alone. National Forests sustain losses of about $.5 million each year.

SOUTHERN REGION (R-8) AND SOUTHEASTERN AREA

Disease	Host	Location	Remarks
Root rot *Armillariella mellea* (Vahl. ex Fr.) Karst. *Armillariella tabescens* (Fr.) Sing. *Phaeolus schweinitzii* (Fr.) Pat *Phytophthora* spp.	All species	Southwide	Thousands of acres were affected southwide. For conifers, the diseases were more common on clay soils. For hardwoods, they had more problems on sites with a low site index and older growth trees. 1981 losses are estimated at 2-4 percent of the hardwood resource and less than 1 percent for conifers. Losses were more severe this year because of drought stress.
Foliage Disease			
Brown spot needle blight *Scirrhia acicola* (Dearn.) Sigg.	Longleaf pine	North Carolina, Florida, Georgia, South Carolina, Alabama, Mississippi	Light damage in most areas, with severe losses in localized longleaf stands. Control burns reduced the severity of this disease.
Vascular Wilt			
Oak wilt *Ceratocystis fagacearum* (Bretz) Hunt	Oak	North Carolina, South Carolina, Tennessee, Kentucky, Arkansas, Oklahoma, Texas	The traditional oak wilt disease remains at endemic level. No new counties were reported in 1981. However, the disease, previously called "live oak decline," is now believed to be caused by the oak wilt fungus. Like oak death, caused by *C. fagacearum*, is believed to be confined to Texas.
Dutch elm disease *Ceratocystis ulmi* (Buism.) C. Mor.	Elm	Georgia, Kentucky, North Carolina, South Carolina, Alabama, Arkansas, Oklahoma	Mortality is highly variable, depending on when the disease was first reported in an area. Some States, like Alabama, have single tree reports, while other areas, such as Kentucky and Virginia, have extensive areas of mortality. The disease is more common along drainages.
Nursery/Seed Orchard			
Root rots			
Macrophomina phaseolina (Maub.) Ashby	Dogwood	Florida	Lost 100,000 one-year-old seedlings, valued at $6,000.
Cylindrocladium crotalariae Morg.	Yellow poplar, sweetgum, eastern white pine	North Carolina	Caused localized seedling damage to 1-year-old yellow poplar and sweetgum seedlings, along with 2-year-old eastern white pine seedlings, during the early fall of 1981. Disease incidence and plantable seedling losses were most severe (several thousand seedlings) on the 1-0 yellow poplar seedlings.
Phythium spp.	Eastern white pine	Tennessee	Caused severe seedling stunting, yellowing, and feeder root necrosis on several million 2-year-old eastern white pine seedlings.
Phytophthora cinnamoni Rands	Fraser fir	North Carolina	Losses exceeded 50 percent of the crop. A new fungicide seems to be effective in reducing losses.
Fusiform rust *Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme*	Slash pine	Florida	Caused severe losses (100,000+ seedlings) to 1-year-old slash pine seedlings during the 1981 growing season.
Seed fungi Variety of fungi including *Fusarium moniliforme* var. *subglutinans* (Wr. & Reink) *Diplodia* sp. *Fusarium* sp.	Slash pine	Southwide	In a 1980-81 southwide slash pine seed fungi survey, all of the seed evaluated had some fungi, with as high as 88 percent internal fungi from one orchard and as low as 15 percent in another orchard. One orchard had 43 percent of the sound seed and 31 percent of the unsound seed with internal, known pathogenic fungi.

SOUTHERN REGION (R-8) AND SOUTHEASTERN AREA

Disease	Host	Location	Remarks
Lesser cornstalk borer *Elasmopalpus lignosellus* (Zeller)	Arizona cypress, bald cypress, dogwood	Florida	Caused localized severe damage to 1-0 seedlings.
Mycorrhizae *Pisolithus tinctorius* (Pers.) Cok & Couch	Conifers	Southwide	Successful *P. tinctorius* inoculations were obtained in over 75 percent of the combined 33 bareroot and 18 container seedling nurseries. Significant increases in total ectomycorrhizal development and seedling fresh weights, along with decreased seedling culls, were obtained in most cases. An ectomycorrhizal inoculum applicator was successfully field tested in four southern nurseries. Over one million seedlings were inoculated in 1981.
Abiotic			
Air pollution	Eastern white pine	North Carolina, South Carolina, Virginia, Kentucky, Tennessee	About 10 percent of the white pine were affected over a large area. Probably caused by ozone.
Drought	All trees	Southeastern United States	The 1980 drought continued through 1981, resulting in serious tree stress and concurrent stress-related problems, such as *Ips* beetles, declines, and other secondary problems.

EASTERN REGION (R-9)[1] AND NORTHEASTERN AREA

Insect	Host	Location	Remarks
Spruce budworm Choristoneura fumiferana (Clemens)	Fir, spruce	Maine, New Hampshire, Vermont, Minnesota, Wisconsin, Michigan	In 1981, the budworm defoliated 4.4 million acres, 2 million less than in 1980. In Maine, the intensity of the outbreak has lessened since the peak of 1978. Defoliation is also down in Vermont and New Hampshire, although half of the acres defoliated in New Hampshire contain more than 50 percent dead tops and many dead trees. In the Lake States, only 355,000 acres were defoliated, compared to 1.4 million acres in 1980. In Wisconsin and Michigan, populations nearly collapsed.
Gypsy moth Lymantria dispar (L.)	Hardwoods	Northeastern United States	Approximately 12.8 million acres were defoliated, an increase of almost 8 million acres compared to 1980. This is the largest outbreak ever. Eleven States from Maryland to Maine are now considered generally infested. Defoliation in every State affected increased greatly, except for New York where defoliation was already high last year with over 2 million acres defoliated. States where defoliation increased over one million acres include Connecticut, Massachusetts, New Hampshire, and Pennsylvania. The gypsy moth has been reported in 18 other States, including Florida and California. Moths are numerous throughout Ohio, and in Michigan 18 acres were defoliated.
Forest tent caterpillar Malacosoma disstria Hubner	Hardwoods	New York, Vermont, Maine, Minnesota	Populations increased in all areas in 1981. In southeastern New York, where 200,000 acres were defoliated, large sugarbrush areas have been affected. The number of acres defoliated in Vermont was 117,000, twice as much as last year. Acres defoliated in Maine increased fourfold to one-half million acres. In northern Wisconsin and Minnesota, over 2.5 million acres are affected, with mortality occurring in areas defoliated for the past 4 years.
Saddled prominent Heterocampa guttivitta (Walker)	Hardwoods	Massachusetts, New Hampshire, Vermont, Maine	A record 500,000 acres were defoliated in New Hampshire. Severe branch mortality was reported. In Vermont, defoliation was down slightly to less than 30,000 acres, with mortality occurring on 2,000 acres. Infestations in Massachusetts and Maine increased, in Maine nearly seventeenfold. In both States, nearly 200,000 acres were defoliated.

[1] Includes forests in Connecticut, Illinois, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, Maine, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

EASTERN REGION (R-9) AND NORTHEASTERN AREA

Disease	Host	Location	Remarks
Stem and Branch			
Scleroderris canker *Gremmeniella abietina* (Lagerb.) Morlet	Scotch, jack, red pine	Wisconsin, Michigan, Minnesota, New York, Vermont, New Hampshire, Maine	As in 1980, the spread of Scleroderris canker was drastically reduced in 1981. No new infected towns were located in Vermont or Maine. In New York, only one new town was found infected. No infection has been found in New Hampshire since 1978. Infection was reported as light throughout Minnesota, Michigan, and Wisconsin. The more virulent European strain of the fungus has not been found in the Lake States. New York reported a dual infection period in 1981 due to warm temperatures in February, which increased the infection rate and may result in increased spread of the disease next year.
Dwarf mistletoe *Arceuthobium pusillum* Pk.	Black spruce, red spruce	Minnesota, Wisconsin, Maine, New Hampshire	A local problem in northern Minnesota and Wisconsin and along the coast in Maine. Several red spruce stands in New Hampshire are infected.
European larch canker *Lachnellula willkommii* (Hartig) Dennis	Tamarack	Maine	Six towns along the coast in Washington County were found infected. The oldest cankers observed were at least 5 years old. This is the first finding of the disease in the United States since the infection discovered in 1924 in Massachusetts was eradicated.
Beech bark disease *Cryptococcus fagisuga* Lind. and *Nectria coccinea* var. *faginata* Loh., Wats. and Ay.	American beech	New England, New York, New Jersey, Pennsylvania, West Virginia	The disease continues to spread southward into southern Pennsylvania and New Jersey. This year the disease was found for the first time in West Virginia, where over 70,000 acres were found infested with the scale insect, associated with the fungus *Nectria galligena*.
Foliage Disease			
Larch needlecast *Mycosphaerella* spp.	European larch	Wisconsin, Iowa, Michigan	This disease was first noted in the United States in 1980 in Wisconsin. This year one county in Michigan and two counties in Iowa were found to be infected. Incidence is expected to slowly increase.
Vascular Wilt			
Oak wilt *Ceratocystis fagacearum* (Bretz) Hunt	Oak	Michigan, Minnesota, Wisconsin, Missouri, Iowa, West Virginia, Ohio, Indiana	Throughout the area, disease incidence is reported to be about the same as last year. In Missouri, only scattered cases were found, down dramatically from damaging levels of 1980.
Dutch elm disease *Ceratocystis ulmi* (Buism.) C. Mor.	*Ulmus* sp.	Throughout Northeastern States	The disease continues to cause mortality of forest and urban elms. Incidence of the disease has greatly increased in Minnesota, while in Maine a second "wave" of infection is devastating the remaining live trees. In Wisconsin, it is estimated that 50 percent of the population was lost from 1956 to 1978, and of the remaining larger elms, 80 to 90 percent are infected.

EASTERN REGION (R-9) AND NORTHEASTERN AREA

Disease	Host	Location	Remarks
Pinewood nematode Bursaphelenchus xylophilus (Steiner & Buhrer) Nickle	20 species of pine, cedar, spruce, tamarack, European larch, balsam fir	Found in all the Northeastern Area States except Rhode Island, Maine, and New Hampshire	The nematode, formerly thought to be introduced from Japan, is now believed to be native to the United States. This is based on preserved specimens collected in Louisiana in 1934. Thus damage from this pest will probably not increase drastically.
Other			
Larch decline (Cause undetermined)	Tamarack	Maine, New Hampshire, Vermont, New York	Scattered mortality and general decline of larch throughout natural range.

ALASKA REGION (R-10)[1]

Insect	Host	Location	Remarks
Spruce beetle *Dendroctonus rufipennis* (Kby)	White and Sitka spruce	Alaska	Overall beetle populations decreased since last year; infestations covered approximately 227,500 acres. This decline was most apparent in the Beluga Lake area on the west side of Cook Inlet. Infestations increased in the Summit Lake area and on the Chugach National Forest.
Engraver beetle *Ips perturbatus* (Eichh.)	White spruce	Alaska	In 1981, 2,015 acres were infested compared with 1,760 acres in 1980. The largest infestation occurred northwest of Farewell Lodge on the south fork of the Kuskokwim River.
Ambrosia beetle *Trypodendron lineatum* (Olivier)	Spruce, hemlock	Alaska	During 1981 extensive ambrosia beetle flights affected logging and milling operations in several southeast Alaska locations and on Afognak Island, where the situation is especially serious. Four million board feet of Sitka spruce were fumigated enroute to Japan this year, leaving one million board feet infested on the island.
A spruce budworm *Choristoneura*, probably *orae* Free.	White spruce	Alaska	In residential and park areas around Anchorage, populations continued to decline. However, budworm populations were high between Copper Center and Chitna, where 6,700 acres of defoliation were detected. Moderate budworm damage was also detected along 25 miles of the Edgerton Highway.
Western blackhead budworm *Acleris gloverana* (Walsingham)	Hemlock	Alaska	Populations are still at endemic levels throughout southeast Alaska.
Large aspen tortrix *Choristoneura conflictana* (Wlkr)	Aspen	Alaska	Heavy defoliation was detected on 38,200 acres; an increase of 26,600 acres over 1980. Most of this increase was between the town of Chicken and the Canada-U.S. border in interior Alaska. This is the first time the tortix has appeared in interior Alaska in almost a decade.
Willow leafminer *Rhynchaenus rufipes* (LeC.)	Willow	Alaska	Leafminer populations decreased for the second year; only 450 acres of defoliation were detected compared to 2,750 acres in 1980.
A leafroller *Epinotia solandriana* L.	Birch	Alaska	No leafroller-caused defoliation was detected in 1981, compared to 146,140 acres in 1980.
Blotch miners *Lyonetia* spp.	Cottonwood	Alaska	Blotch miner populations remained low for the third consecutive year throughout most of interior Alaska. However, heavy activity was evident on 8,250 acres of cottonwood near Seward.
Bud moths possibly *Zeirophera* spp.	Sitka spruce	Alaska	For the past several years, populations have been building up in plantations in and around Dutch Harbor and Unalaska on the Aleutian Islands. Over 90 percent of the buds are infested in some areas.

[1] Includes forests in Alaska.

ALASKA REGION (R-10)

Insect	Host	Location	Remarks
Spruce needle aphid *Elatobium abietinum* (Walker)	Sitka spruce	Alaska	High populations caused defoliation on 21,000 acres in 1981. The Ketchikan area was most heavily affected; some damage also occurred in the Stikine and Chatham areas.
Hemlock sawfly *Neodiprion tsugae* (Midd.)	Hemlock	Alaska	Populations remained at endemic levels during 1981.

ALASKA REGION (R-10)

Disease	Host	Location	Remarks
Stem and Branch			
Hemlock dwarf mistletoe *Arceuthobium tsugense* (Rosend.) G.N. Jones	Hemlock	Alaska	This is one of the major forest pests in southeastern Alaska. This disease is widespread in old growth stands from Haines to Portland Canal.
Root Disease			
Cedar dieback	Cedar	Alaska	Cedar dieback appears to be a growing problem in southeastern Alaska. Approximately 17,700 acres of dead and dying cedar were observed during aerial reconnaissance. The cause of the mortality appears to be a root disease with the cedar bark beetle (*Phloesinus* spp.) being secondary.
Foliage Disease			
Spruce needle rust *Chrysomyxa ledicola* Lagerh.	White spruce	Alaska	Incidence of this disease decreased dramatically in 1981. Only 15,300 acres of infected spruce were detected northeast of Dillingham. This compares with 100,000 acres in 1980.
Abiotic			
Spruce winter kill	White spruce	Alaska	Approximately 5,000 acres of white spruce were "browned" by an abiotic factor such as warm winter winds. Areas most affected were along the McKinley River southwest of Wonder Lake, northwest of Wonder Lake, and 50 miles southwest of Northway along the Canada-U.S. border.
Larch dieback	Larch	Alaska	Almost 146,000 acres of scattered larch were affected by an unknown "dieback." All age classes were affected. The cause of the dieback may be an abiotic factor such as above average precipitation. This dieback was first observed in 1980; all affected trees appeared healthy the following spring.

TABLE 1.--TREND IN THE NUMBER OF ACRES OF AERIALLY DETECTED TREE DEFOLIATION CAUSED BY THE GYPSY MOTH (Lymantria dispar) IN THE NORTHEAST 1/

State	Year 1980	1981	Trend
Connecticut	372,000	1,482,000	+1,110,000
Delaware	0	500	+ 500
Maine	221,000	656,000	+ 435,000
Maryland	3	9,000	+ 9,000
Massachusetts	906,000	2,826,000	+1,920,000
New Hampshire	184,000	1,947,000	+1,763,000
New Jersey	412,000	799,000	+ 387,000
New York	2,450,000	2,304,000	- 146,000
Pennsylvania	441,000	2,528,000	+2,087,000
Rhode Island	44,000	273,000	+ 229,000
Vermont	41,000	49,000	+ 8,000
Total	5,071,003	12,873,500	+7,802,000

1/ Information provided by cooperating State agencies and USDA APHIS and Forest Service. This table does not include 18 acres defoliated by the gypsy moth in Michigan.

Table 2.--TREND IN NUMBER OF ACRES OF AERIALLY DETECTED TREE DEFOLIATION CAUSED BY SPRUCE BUDWORM (*Choristoneura fumiferana*) IN THE NORTHEASTERN UNITED STATES.

State	Year 1980	1981	Trend
Maine	5,000,000	4,000,000	-1,000,000
Michigan	859,000	161,000	- 698,000
Minnesota	103,000	110,000	+ 7,000
New Hampshire	90,000	42,000	- 48,000
Vermont	111,000	94,000	- 17,000
Wisconsin	439,000	84,000	- 355,000
Total	6,602,000	4,491,000	-2,111,000

Table 3.--TREND IN NUMBER OF ACRES OF AERIALLY DETECTED TREE DEFOLIATION CAUSED BY THE WESTERN SPRUCE BUDWORM (*Choristoneura occidentalis* Free.) IN THE WESTERN UNITED STATES

Region	Year 1980	1981	Trend
Region 1	976,072	931,953	- 44,119
Region 2	1,052,000	1,768,000	+716,000
Region 3	299,000	477,960	+178,960
Region 4	1,522,000	1,411,200	-110,800
Region 5	--	--	--
Region 6	229,400	342,690	+113,290
Total	4,078,472	4,589,113	+510,641

TABLE 4.--STATUS OF MOUNTAIN PINE BEETLE INFESTATIONS BY STATE IN LODGEPOLE PINE, 1981

State	Land Ownership Class	Thousands of Acres Infested	Thousands of Trees Killed	Volume 1/ Killed (MCF)
Colorado	National Forest....	20.5	46.4	376.8
	Other Federal.....	4.1	6.8	55.8
	State & Private....	12.4	21.8	177.0
	Total.....	37.0	75.0	609.6
Idaho	National Forest....	593.8	447.0	5987.9
	Other Federal.....	0.0	0.0	0.0
	State & Private....	70.4	177.5	3907.4
	Total.....	664.2	624.5 ±14% 2/	9895.3 ±15% 2/
Montana 3/	National Forest....	806.0	3019.8	36237.6
	Other Federal.....	1159.4	4396.3	107.4
	State & Private....	387.0	1201.8	14421.6
	Total.....	2352.4	8617.9	50766.6
Oregon	National Forest....	453.2	2586.9	30822.4
	Other Federal.....	13.9	90.2	1075.2
	State & Private....	55.0	330.9	3942.4
	Total.....	522.1	3008.0 ±17.8%	35840.0 ±20.8%
Utah	National Forest....	148.5	72.8	862.0
	Other Federal.....	2.6	1.5	18.0
	State & Private....	3.1	1.5	18.0
	Total.....	154.2	75.8 ±24%	898.0 ±28%
Washington	National Forest....	36.6	52.6	765.7
	Other Federal.....	1.9	2.9	39.4
	State & Private....	1.6	2.3	33.5
	Total.....	40.1	57.8 ±23.4%	838.6 ±24.7%
Wyoming	National Forest....	34.9	10.8	148.5
	Other Federal.....	2.2	.7	9.3
	State & Private....	.1	.03	.4
	Total.....	37.2	11.5 +36%	158.2 +41%

1/ Does not include National Park, Monument, Wilderness, or other dedicated areas.

2/ % Standard Error - These estimates do not include infested trees removed as a result of suppression projects, salvage operations, or firewood gathering.

3/ Estimates made from aerial sketchmap surveys.

TABLE 5.--STATUS OF MOUNTAIN PINE BEETLE INFESTATIONS BY STATE IN PONDEROSA PINE, 198

State	Land Ownership Class	Thousands of Acres Infested	Thousands of Trees Killed	Volume 1/ Killed (MCF)
Colorado 3/	National Forest....	61.7	38.4	574.8
	Other Federal.....	0.5	0.4	7.4
	State & Private....	19.7	15.6	232.4
	Total.....	81.9	54.4	814.6
Montana	National Forest....	18.9	8.1	53.6
	Other Federal.....	6.4	2.7	18.2
	State & Private....	51.4	21.7	145.1
	Total.....	76.7	32.5 ±8.6% 2/	216.9 ±9.0% 2/
Oregon	National Forest....	43.1	50.7	707.9
	Other Federal.....	0.7	0.8	11.1
	State & Private....	23.8	27.6	387.1
	Total.....	67.6	79.1 ±16.6%	1106.1 ±35.5%
So. Dakota	National Forest....	177.3	280.4	4766.8
	Other Federal.....	13.8	21.8	370.6
	State & Private....	38.9	61.4	1043.8
	Total.....	230.0	363.6	6181.2
Utah	National Forest....	7.8	164.1	5133.3
	Other Federal.....	0.1	1.8	54.6
	State & Private....	0.4	8.7	273.0
	Total.....	8.3	174.6 ±4.0%	5460.9 ±7.0%
Washington	National Forest....	5.3	4.9	87.7
	Other Federal.....	3.2	2.9	50.1
	State & Private....	17.4	16.1	279.6
	Total.....	25.9	23.9 ±20.2%	417.4 ±46.7%
Wyoming 3/	National Forest....	9.1	134.9	2310.3
	Other Federal.....	0.0	0.0	0.0
	State & Private....	9.4	42.5	722.5
	Total.....	18.5	177.4	3032.8

1/ Does not include National Park, Monument, Wilderness, or other dedicated areas.

2/ % Standard Error - These estimates do not include infested trees removed as a result of suppression projects, salvage operations, or firewood gathering.

3/ Estimates made from aerial sketchmap surveys.

TABLE 6.--STATUS OF MOUNTAIN PINE BEETLE INFESTATIONS IN LODGEPOLE AND PONDEROSA PINE IN THE WESTERN UNITED STATES, 1981

Land Ownership Class	Thousands of Acres Infested	Thousands of Trees Killed	Volume 1/ Killed (MCF)
National Forest	2,416.7	6,917.8	88,835.3
Other Federal	1,208.8	4,528.8	1,817.1
State & Private	690.6	1,929.4	25,583.8
Total	4,316.1	13,376.0	116,236.2

1/ Does not include National Park, Monument, Wilderness, or other dedicated areas.

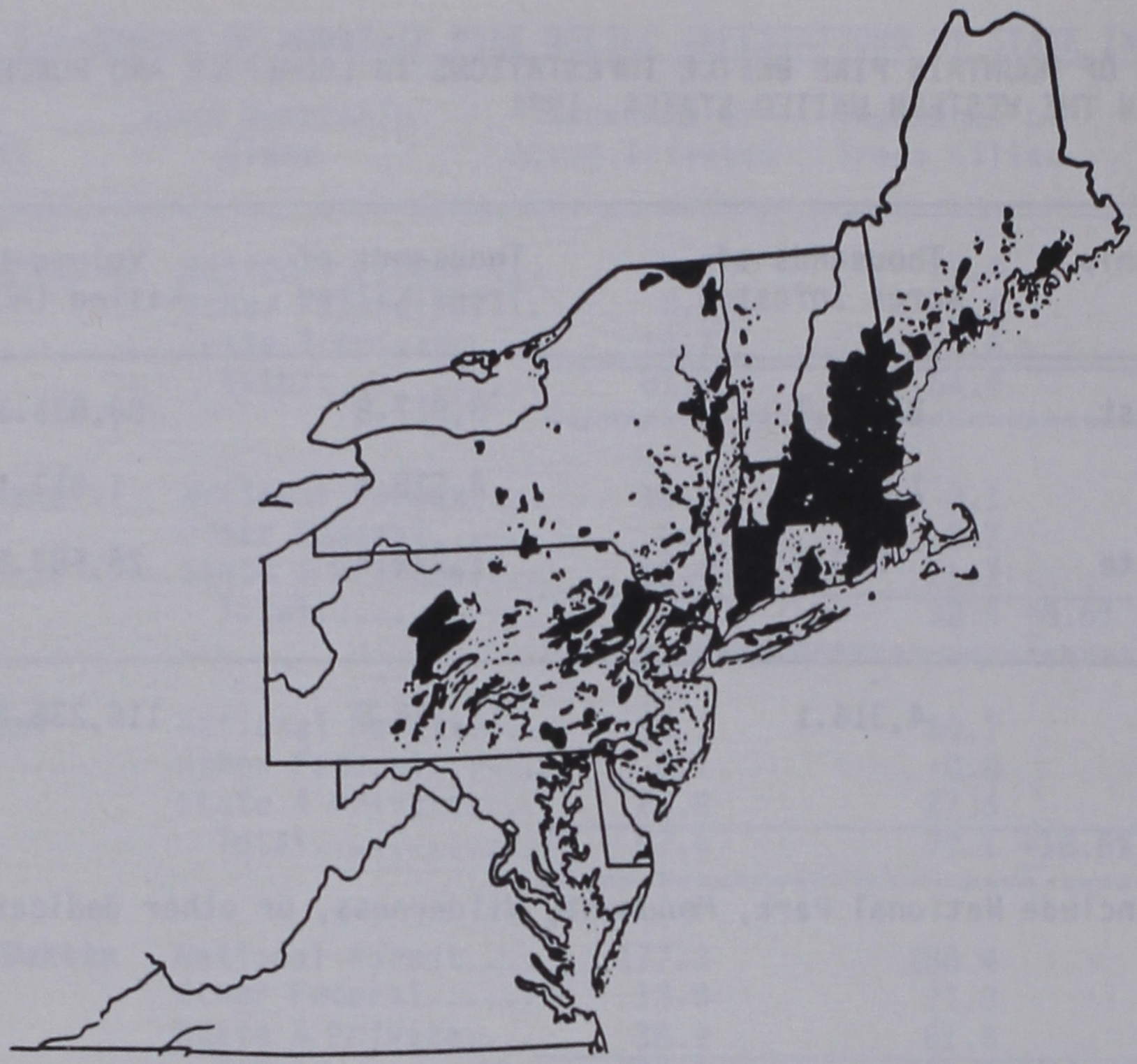


FIG. 1 GYPSY MOTH DEFOLIATION IN THE NORTHEAST, 1981

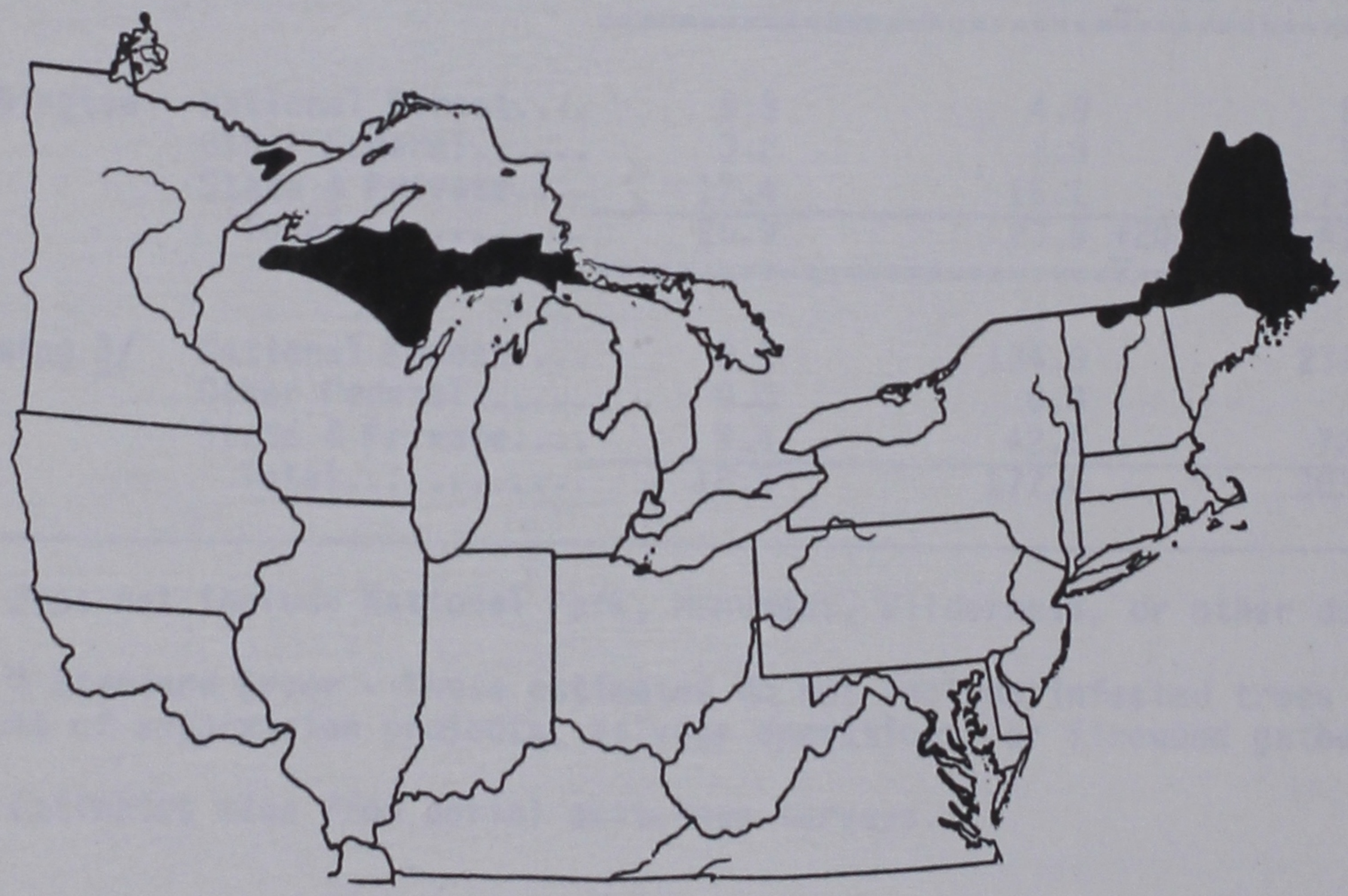


FIG. 2 SPRUCE BUDWORM INFESTED AREAS, 1981

FIG. 3 SOUTHERN PINE BEETLE INFESTED COUNTIES, 1981

FIG. 4 WESTERN SPRUCE BUDWORM INFESTED AREAS, 1981

FIG. 5 MOUNTAIN PINE BEETLE OUTBREAK AREAS, 1981

INDEX--INSECTS

Page

Acacia psyllid 19
Acleris gloverana (Walsh.) 36
Adelges abietis (L.) 28
Adelges cooleyi (Gillette) 8
Adelges picae (Ratz) 23, 26
Adelges tsugae (L.) 28
Alsophila pometaria (Harr.) 28
Ambrosia beetles 22, 36
Anacamptodes pergacilis (Hulst) 28
Archips argyrospilus (Walk.) 18
Archips semiferanus (Walk.) 28
Argyrotaenia sp. 3
Atta texana Buckley 26
Bagworm 27
Balsam woolly aphid 23, 26
Black turpentine beetle 26
Bud moths 36
California flatheaded borer 18
Cedar bark beetles 12
Choristoneura conflictana (Wlkr.) 36
Choristoneura fumiferana (Clem.) 33
Choristoneura lambertiana ponderosana Obrat. 12
Choristoneura occidentalis Free. 3, 7, 12, 15, 22
Choristoneura orae Free. 36
Choristoneura pinus Free. 7
Coleophora laricella (Hbn.) 4, 15, 23
Coleotechnites milleri (Busck) 19
Coleotechnites ponderosae H & S 7
Coleotechnites sp. 12, 15
Coloradia pandora Blake 12, 18
Conopthorus coniperda (Schwarz) 26
Cooley spruce gall aphid 8
Croesia semipurpurana (Kearfott) 28
Dioryctria amatella (Hulst.) 26
Dioryctria clarioralis (Walker) 26
Dioryctria disclusa (Heinrich) 26
Dioryctria zimmermani (Grote) 8
Diprion similis Hartig 26
Douglas-fir beetle 3, 7, 12, 15, 22
Douglas-fir engraver 22
Douglas-fir reproduction weevil 19
Douglas-fir tussock moth 3, 7, 15, 19
Dryocoetes confusus Sw. 3, 7, 15
Eastern spruce gall aphid 28
Eastern tent caterpillar 28
Elatobium abietnum (Walk.) 19, 23, 37
Elm leaf beetle 28
Epinotia solandriana L. 36
Eurasian pine aphid 19

Fall cankerworm 28
Fall webworm 28
Fir engraver beetle 18, 22
Flatheaded fir borer 18
Forest tent caterpillar 4, 15, 28, 33
Fruittree leafroller 18
Gnophothrips fuscus (Morgan) 26
Grasshoppers 19
Gypsy moth 18, 23, 27, 33
Halisidota spp. 13
Hemlock sawfly 37
Hemlock woolly aphid 28
Heterocampa guttivitta (Walker) 33
Hylobius pales (Herbst) 27
Hyphantria cunea (Drury) 28
Ichthyura inclusa (Hubner) 29
Ips perturbatus (Eichh.) 36
Ips pini (Say) 3, 15, 22
Ips spp. 7, 12, 18, 26
Jack pine budworm 7
Jeffrey pine beetle 15, 18
Lamdina pellucidaria (G. & L.) 28
Larch casebearer 4, 15, 23
Large aspen tortrix 36
Leafroller 36
Leptoglossus corculus (Say) 26
Locust leafminer 28
Lodgepole needleminer 19
Lymantria dispar (L.) 18, 23, 27, 33
Lyonetia sp. 36
Malacosoma americanum (F.) 28
Malacosoma disstria Hubner 4, 15, 28, 33
Matsucoccus acalyptus Herbert. 19
Melanophila californica VanDyke 18
Melanophila drummondi Kby. 18
Mountain pine beetle 3, 7, 12, 15, 18, 22
Nantucket pine tip moth 28
Needle miners 15
Neodiprion spp. 13, 27
Neodiprion tsugae (Midd.) 37
Neophasia menapia (Felder & Felder) 7, 15
Oak leaf roller 28
Oak leaf tier 28
Odontata dorsalis (Thunberg) 28
Orgyia pseudotsugata McD. 3, 7, 15, 19
Pachylobius picivorus (Germar) 27
Paleacrita vernata (Peck) 28
Pales weevil 27
Pandora moth 12, 18
Petrova sp. 8
Phyllophaga sp. 13
Phloeosinus spp. 12
Pine butterfly 7, 15
Pine engraver 3, 7, 12, 15, 18, 22, 36

Pine leaf adelgid 28
Pine looper 28
Pine needle miner 12
Pine needle sheathminer 19
Pine sawflies 27
Pine tip moth 8
Pine webworm 28
Pineus pini Koch 19
Pineus pinifoliae (Fitch) 28
Pinyon needle scale 19
Pitch eating weevil 27
Pitch nodule moth 8
Ponderosa pine needle miner 7
Ponderosa pine tip moth 19
Poplar tentmaker 28
Psylla uncatoides (Ferris & Klyver) 19
Pyrrhalta luteola (Mueller) 28
Red turpentine beetle 7, 12, 18
Rhyacionia frustrana (Comstock) 28
Rhyacionia neomexicana (Dyar) 8
Rhyacionia spp. 8
Rhyacionia zozana (Kearfott) 19
Rynchaenus rufipes (LeC.) 36
Saddled prominent 33
Sawflies 13
Scarab beetles 13
Scolytus spp. 12
Scolytus unispinosus LeC. 22
Scolytus ventralis LeC. 18, 22
Seedbugs 26
Slash pine thrips 26
Southern pine beetle 26
Spring cankerworm 28
Spruce aphid 19, 23
Spruce beetle 3, 7, 12, 15
Spruce budworm 33
Tetralopha robustella Zell. 28
Tetyra bipunctata (H.-S.) 26
Texas leafcutting ant 26
Tryphodendron lineatum (Olivier) 36
Vespula pennsylvanica (Saussure) 19
Walkingstick 29
Walnut caterpillar 29
Webbing coneworm 26
Western balsam bark beetle 3, 7, 15
Western blackheaded budworm 36
Western pine beetle 12, 18, 22
Western spruce budworm 3, 7, 12, 15, 22
Western tent caterpillar 7, 12
Western yellowjacket 19
White pine cone beetle 26
Zellaria haimbachi Busck 19
Zimmerman pine tip moth 8

INDEX--DISEASES

Page

Abiotic 11, 14, 17, 21, 25, 32, 38
Agrobacterium tumefasciens (E. F. Smith & Towns.) Conn. 11
Annosus root rot 5, 9, 16, 20, 24, 30
Arceuthobium americanum Nutt. ex Engelm. 5, 6, 9
Arceuthobium douglasii Engelm. 5, 14
Arceuthobium spp. 16, 20, 24
Arceuthobium laricis (Piper) St. John 5
Arceuthobium microcarpum (Engelm.) Hawks. and Weins. 14
Arceuthobium pusillum Pk. 34
Arceuthobium tsugense (Rosend.) G. N. Jones. 38
Arceuthobium vaginatum subsp. cryptopodum
(Engelm.) Hawks. and Wiens. 14
Armillariella mellea (Vahl. ex Fr.) Karst. 5, 9, 14, 16, 20, 31
Armillariella tabescens (Fr.) Sing. 31
Atropellis piniphila (Weir.) Lohm. and Cash. 16
Black-stain root disease 5, 9, 20
Beech bark disease 34
Botrytis cinerea Pers. ex Fr. 6, 10, 25
Brown cubical butt rot 5
Bursaphelenchus xylophilus (Steiner & Buhrer) Nickle 10, 14, 35
Cedar dieback 38
Ceratocystis fagacearum (Bretz) Hunt 31, 34
Ceratocystis ulmi (Buism.) C. Mor. 10, 20, 31, 34
Ceratocystis wageneriі Goheen & Cobb 5, 9, 20
Chrysomyxa ledicola Lagerh. 38
Ciborinia whetzelii Seaver 6
Coleosporium asterum (Diet.) Syd. 17
Comandra blister rust 5, 9
Cronartium comandrae Pk. 5, 9, 16
Cronartium quercuum (Berk.) Miy. ex Shirai f. sp. fusiforme 30, 31
Cronartium ribicola Fisch. 5, 20, 24, 30
Cryphonectria cubensis (Bruner) Hodges 20
Cytospora chrysosperma (Pers.) F. 16
Damping-off 10
Dasyscypha sp. 16
Decay 30
Diplodia pinea (Desm.) Kickx. 9
Dothistroma pini Hulb. 5, 10
Dutch elm disease 10, 20, 31, 34
Dwarf mistletoe 5, 9, 14, 16, 20, 24
Elytroderma deformans (Weir) Dark. 6, 10, 16, 20, 24
Elytroderma needle disease 6, 10, 16, 20, 24
Endothia parasitica (Murr.) P. J. & H. W. And. 30
European larch canker 34
Fomes fraxinophilus (Pk.) Sacc. 9
Fusarium avenacium (Fr.) Sacc. 11
Fusarium moniliforme var. subglutinans Wr. & Reink. 30
Fusarium oxysporum (Schl.) em Snyd. & Hans. 21, 25
Fusarium roseum (Lk.) Snyd. & Hans. 25
Fusarium spp. 14

Gnomonia ulmea (Schw. ex Fr.) Thuem. 10
Gremmeniella abietina (Lagerb.) Morlet 34
Hemlock dwarf mistletoe 38
Heterobasidion annosum (Fr.) Bref. 5, 9, 16, 20, 24, 30
Hypodermella laricis Tub. 5, 6
Inonotus tomentosus (Fr.) Gilbn. 16
Lachnellula willkommii (Hartig) Dennis 34
Laminated root rot 5
Larch decline 35
Larch needle cast 5, 6, 16, 24, 34
Lirula abietis-concoloris (Mayr ex Dearn.) Darker 17
Lophodermella cerina (Dark.) Darker 9
Lophodermella concolor (Dearn.) Darker 6, 17
Lophodermium needle cast 6, 9, 17
Lophodermium pinastri (Schrad. ex Hook.) Chev. 6
Marssonina populi (Lib.) Magn. 10
Melampsora medusae Thuem. 10
Melampsora spp. 16
Meria laricis Vuill. 5, 6, 16, 24
Mycosphaerella spp. 34
Nectria coccinea var. *faginata* Loh., Wats. and Ay. 34
Naemacyclus sp. 9
Oak wilt 31
Peridermium filamentosum Pk. 9
Phacidium infestans Karst. 17
Phaeocryptopus gaumanni (Rhode) Petr. 24
Phaeolus schweinitzii (Fr.) Pat. 5, 16, 31
Phoma sp. 10
Phomopsis juniperova Hahn 10
Phoradendron spp. 20
Phytophthora sp. 25, 30
Pinewood nematode 14, 35
Pissolithus tinctorius (Pers.) Cok. & Couch 32
Pitch canker 30
Pucciniastrum spp. 17
Pythium aphanidermatum (Edson) Fitzp. 6
Pythium ultimum Trow 6
Red band needle blight 5, 10
Rhabdocline pseudotsugae Syd. 6, 17
Rhizoctonia sp. 6
Rhizosphaeria kalkhoffii Bub. 10
Root rot 31
Sand pine root disease 30
Scirrhia acicola (Dearn.) Sigg. 13, 31
Scirrhia pini Funk and Parker 16
Scleroderris canker 34
Seed fungi 31
Septoria aceris (Lib.) Berk. & Br. 16
Shoestring root rot 5, 9, 14, 16, 20
Sirococcus strobilinus Preuss. 6, 10
Spruce needle rust 38
Thyronectria austro-americanan (Speg.) Seeler 9
Venturia macularis (Fr.) Mueller & Arx 6
Venturia populina (Vuill.) Fabric. 10
White pine blister rust 5, 20, 24, 30

GOVERNMENT PRINTING OFFICE: 1982-360-932:FS-1110